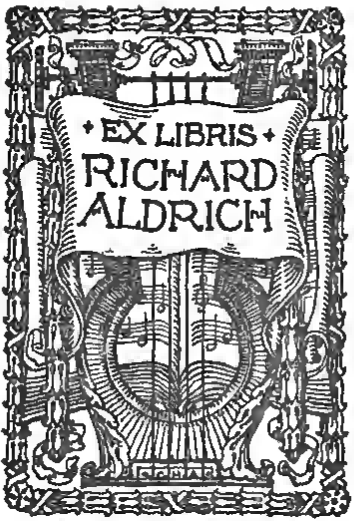
Proceedings of the Musical Association

Musical Association (Great Britain)



42

PROCEEDINGS

OF THE

MUSICAL ASSOCIATION

FOR THE INVESTIGATION AND
DISCUSSION OF SUBJECTS CONNECTED WITH THE
ART AND SCIENCE OF MUSIC.

FOUNDED MAY 29, 1874.

SIXTEENTH SESSION, 1889-90.

LONDON
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CONTENTS.

RULES AND REGULATIONS

Passed at Five Special General Meetings of the Members, held at 27, Harley Street, W., on February 7 and April 3, 1876, on January 6, 1879, on December 6, 1886, and on June 2, 1890.

OBJECTS AND CONSTITUTION.

THIS Association is called the "MUSICAL ASSOCIATION" and is formed for the investigation and discussion of subjects connected with the Art, Science, and History of Music; and is intended to be similar in its organisation to existing Learned Societies

It is not intended that the Association shall give concerts, or undertake any publications other than those of their own Proceedings, or the Papers read at their Meetings.

MEMBERS.

The Association shall consist of practical and theoretical musicians, as well as those whose researches have been directed to the science of acoustics, the history of the art, or other kindred subjects.

Any person desirous of being admitted into the Association must be proposed by two members. Foreigners resident abroad and distinguished in the Art, Science, or Literature of Music, may be nominated by the Council for election as Honorary Members of the Association.

Elections will take place by ballot of the members present at any of the ordinary meetings, and one adverse vote in four shall exclude.

No newly elected member shall be entitled to attend the meetings until the annual subscription be paid.

SUBSCRIPTION.

The annual subscription to the Association is one guinea, which shall become due on the 1st of November in each year.

Any member *may*, upon or at any time after election, become a life member of the Association by payment of a composition of £10 10s. in lieu of future annual subscriptions, but in addition to any annual subscription previously paid or due from such member. Such sums shall from time to time be invested in legal security in the names of Trustees, to be appointed by the Council.

Any member intending to resign his membership shall signify his wish by notice in writing to the Hon. Sec. on or before the 31st of October, otherwise he shall be liable for his subscription for the ensuing year.

MEETINGS.

An ordinary meeting shall be held on the second Tuesday in every month, from November to June inclusive, at 8 P.M., when, after the despatch of ordinary business, Papers will be read and discussed, the reading to commence not before 8.15 P.M.

An annual general meeting of members only shall be held at 8 P.M. on the last Tuesday in October, to receive and deliberate on the Report of the Council, and to elect the Council and officers for the ensuing year.

Special general meetings may be summoned whenever the Council may consider it necessary; and they shall be at all times bound to do so on receiving a requisition in writing from five members, specifying the nature of the business to be transacted. At least one week's notice of such special meeting shall be given by circular to every member, and ten members present at any general meeting shall constitute a quorum.

Every member shall have the privilege of introducing one visitor at the ordinary meetings, on writing the name in a book provided for that purpose, or sending a written order.

COMMUNICATIONS.

Papers proposed to be read at the meetings may treat of any subject connected with the Art, Science, or History of Music, Acoustics, and other kindred subjects.

Papers will be received from or through any member of the Association.

Experiments and performances may be introduced, when limited to the illustration of the Paper read.

All communications read will become thenceforth the property of the Association (unless there shall have been some previous arrangements to the contrary), and the Council may publish the same in any way and at any time they may think proper.

REPORTS.

A Report of the Proceedings of the Association, including the Papers read or abstracts of the same, and abstracts of the Discussions, shall be printed and distributed to the members as soon as possible after the end of each session.

This Report will be arranged and edited by the Honorary Secretary, under the direction of the Council.

COUNCIL AND OFFICERS.

The management of the affairs of the Association shall be vested in a Council, to be elected by ballot at the general meeting of the members on the last Tuesday in October.

The Council shall consist of a President, Vice-Presidents, and ten ordinary members of the Association.

The Honorary Secretary of the Association shall be *ex officio* an ordinary member of Council.

The President, Vice-Presidents, Auditors, and five ordinary members of the Council shall retire every year, but shall be eligible for re-election.

At the annual general meeting in October, the Council shall present a balloting list, showing the names of the persons whom they propose for the offices of President, Vice-Presidents, and ordinary members of Council for the ensuing year. A copy of this list shall be given to each member present.

In voting, each member may erase any name or names from the balloting list, and may substitute the name or names of any other person or persons whom he considers eligible for each respective office; but the number of names on the list, after such erasure or substitution, must not exceed the number to be elected to the respective offices as above enumerated. Those lists which do not accord with these directions shall be rejected.

The Chairman of the meeting shall cause the balloting papers to be collected, and after they have been examined by himself and two scrutineers, to be appointed by the members, he shall report to the meeting the result of such examination, and shall then destroy the balloting papers. Auditors shall be appointed at the annual general meeting by the members, and the statement of accounts shall be sent by the Treasurer to the Auditors, and be remitted by them to the Secretary in time to enable the Council to judge of the prospects of the Association, and to prepare their report in accordance therewith.

The Council and officers shall meet as often as the business of the Association may require, and at every meeting three members of Council shall constitute a quorum.

ENACTMENT OR ALTERATION OF RULES AND REGULATIONS.

No rules and regulations can be enacted, altered, or rescinded, except at a special meeting of members summoned for the express purpose, the summons stating distinctly and fully the matter to be brought under consideration.

MUSICAL ASSOCIATION.

FOR THE INVESTIGATION AND DISCUSSION OF SUBJECTS CONNECTED WITH THE ART AND SCIENCE OF MUSIC.

FOUNDED MAY 29, 1874.

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MUSICAL ASSOCIATION.

FIFTEENTH SESSION, 1888-89.

REPORT.

THE Annual General Meeting of the Musical Association was held at No. 27, Harley Street, W., on Monday, October 28, 1889:

MAJOR CRAWFORD in the Chair.

The following REPORT *of the Council was read by the Secretary:—*

1. In presenting to the Members the fifteenth Annual Report, the Council is glad to be able to announce, as usual, the continued prosperity and usefulness of the Musical Association. During the session now coming to a close, papers have been read by Messrs. Ridley Prentice, Edmund H. Turpin, F. Corder, G. A. Audsley, E. J. Payne, E. F. Jacques, Arthur Hill, and D. J. Blaikley. These papers, together with their several discussions, have been printed in the Proceedings of the Association, a copy of which has been sent to every Member.

2. In the Report presented to the last General Meeting allusion was made to the loss which the Association had sustained by the deaths of Professor Sir G. A. Macfarren and Mr. William Chappell, and it is with feelings of the sincerest sorrow that the Council has to make a similar announcement this year. Dr. W. H. Monk, a Vice-President of the Association, died last March, and in the following month the President, the Rev. Sir F. A. Gore Ouseley, also passed away suddenly. Messages of condolence were in each case sent, on behalf of the Association, to the relatives, but the Council desires to record in this place its sense of the great abilities severally exhibited by the deceased gentlemen in furtherance of the ends of true musical art.

3. It is a matter for congratulation that the membership has increased somewhat during the past year. While gladly recognising this encouraging sign of interest in the Association, the Council would still urge upon the individual

members to do their utmost to promote continued progress in this direction, as there is always a drain upon the strength of the Association in the shape of death and resignation. In the latter case, inability to attend the meetings is frequently pleaded, but the Council would point out that the return to Members for their subscriptions is not only the privilege of listening to the various papers, but the consciousness of supporting a Society which exists solely that valuable contributions to Musical Literature, such as those comprised in the Annual Reports of the last fifteen years, may be read, discussed, and published. If the Members generally were not sensible of this, the usefulness of the Association would be at an end.

4. The Balance Sheet, duly audited, lies upon the table for the inspection of Members. There is still a small balance owing to the Treasurer, and the Council must again draw the attention of Members to the inconvenience resulting from laxity in the payment of subscriptions, to which cause alone is attributable the above unsatisfactory item in the year's accounts. It is obvious that the Balance Sheet must be based, not upon the amount recoverable, but upon the amount actually received by the Treasurer during the financial year.

5. Arrangements are in progress for the next session. The Council will always be glad to receive, from or through Members, offers of papers to be read at the Meetings, while shorter communications will also be welcome.

6. In accordance with the rules, the Vice-Presidents and five Ordinary Members of Council, Messrs. Barry, Cummings, Prendergast, Prout, and Southgate retire from office. The Council makes the following proposals to fill up the vacant offices: To be President, Sir John Stainer, M.A., Mus. Doc., in place of the late Sir Frederick Ouseley; to be new Vice-Presidents, Mr. W. H. Cummings and Dr. C. Hubert H. Parry; and to be an Ordinary Member of Council, in place of Mr. W. H. Cummings, Dr. Charles W. Pearce. With the exception of these changes, the other gentlemen who retire are recommended for re-election; but Members are reminded of their right to nominate others for office.

THE MUSICAL ASSOCIATION.

Hon Treasurer's Statement of Receipts and Disbursements from November, 1888, to October, 1889.

Dr.

	£	s.	d.
To Subscriptions received for 1888	3	3	0
,, ,, ,, ,, 1889	119	14	0
,, Sale of Copies of the Proceedings	4	10	0
,, Dividends on £350 at 2½ per cent.	8	10	4
,, Balance due to Treasurer	9	19	6
	£145	16	10

Subscriptions outstanding —	£	s.	d.
3—1886	3	3	0
5—1887	5	5	0
12—1888	12	12	0
23—1889	24	3	0
Part subscription, 1887	0	13	0
	£45	16	0

Cr.

	£	s.	d.
By Balance due to Treasurer on last Account	4	7	0
,, Printing	62	13	6
,, Advertising	7	10	0
,, Reporting	16	5	6
,, Rent of Rooms	14	3	6
,, Petty Expenses	10	17	4
,, Assistant Secretary's Salary	30	0	0
	£145	16	10

Examined and found correct,

W. S. COLLARD,
D. J. BLAIKLEY, } *Auditors*

ALFRED H. LITTLETON,
Hon. Treasurer.

November 4, 1889

C. A. BARRY, Esq.,

In the Chair.

ON THE MUSICAL SCALE

By Rev. W. J. Habens, B.A. (London), Inspector-General of New Zealand Schools.*

In a footnote to Blaserna's "Theory of Sound in relation to Music" (p. 94), it is stated that Euler was acquainted with the importance of the numbers 2, 3, and 5, and that he "established upon them a rule for the development of our musical system." To understand this statement it is necessary to know that a musical note is an effect of regular vibrations of a sounding body—that is to say, of vibrations occupying equal intervals of time; and that two notes cannot be consonant unless the proportion subsisting between their two rates of vibration is simple. These things being understood, it may be shown that the importance of the numbers 2, 3, and 5, employed for the purpose of expressing the ratios of vibration rates, cannot be overestimated. When the intervals between musical notes are expressed by the ratios of the vibration rates of the notes, these three numbers alone, with their squares, cubes, and other powers, and numbers arising from their intermultiplication, are capable of expressing the ratios of consonant notes; and not only so, but they alone are capable of expressing the ratios of all notes belonging to the same scale, and of all notes belonging to all scales into which it is possible to pass from the original scale by modulation.

Any prime number higher than 5 occurring in the expression for the ratios of two notes indicates that those two notes

* Mr Habens being resident in New Zealand the paper was read by the Assistant Secretary.

cannot both belong to the same musical system. For example, if for every 6 vibrations of one note another note has 7 vibrations, these notes are not musically related, they cannot even enter together into any discord recognised in music. Two notes having the ratio 14 : 7 are at the interval of an octave, but this ratio ought to be written 2 : 1, and 7 has nothing to do with the ratio.

The simplest ratio is 2 : 1, where the higher note is an octave above the lower. The ratio 4 : 1 expresses an interval of two octaves, and 8 : 1 three octaves. If we consider only the ratios of consecutive numbers, and take them in order, beginning with the simplest, the intervals are found to be as follows:—

Ratio 2 : 1 — Octave.
„ 3 : 2 — Perfect fifth.
„ 4 : 3 — Perfect fourth ($2 \times 2 : 3$).
„ 5 : 4 — Major third ($5 \quad 2 \times 2$).
„ 6 : 5 — Minor third ($3 \times 2 : 5$).
„ 7 : 6 — No relation (7 is prime).
„ 8 : 7 — „ („).
„ 9 : 8 — Greater tone ($3 \times 3 : 2^3$).
„ 10 : 9 — Lesser tone ($5 \times 2 \quad 3^2$).
„ 11 : 10 — No relation (11 is prime).
„ 12 : 11 — „ (11 „).
„ 13 : 12 — „ (13 „).
„ 14 : 13 — „ (7×2 and 13).
„ 15 : 14 — „ ($5 \times 3 : 7 \times 2$).
„ 16 : 15 — Semitone ($2^4 : 5 \times 3$).

The next ratio in the series that is not to be rejected on account of primes higher than 5 is—

Ratio 25 : 24 — Minor semitone ($5^2 : 3 \times 2^3$).

And the next is—

Ratio 81 : 80 — Comma ($3^4 : 5 \times 2^4$).

This last interval is the difference between the intervals of the greater tone and lesser tone (the ratio of $\frac{9}{8}$ to $\frac{10}{9}$, that is, of $\frac{27}{24}$ to $\frac{30}{27}$). The ratio 25 : 24 belongs to the interval of the lesser semitone, which is the difference between the major third and the minor third (the ratio of $\frac{5}{4}$ to $\frac{6}{5}$, that is, of $\frac{30}{24}$ to $\frac{30}{25}$).

It will be seen that all the numbers that are not rejected are the numbers 2, 3, and 5, and numbers resulting from raising these to higher powers, or from their inter-multiplication. The intervals obtained from ratios of consecutive numbers alone are, as has been shown, the octave, perfect fifth, major third, minor third, greater tone, lesser tone, semitone, lesser semitone, and comma. Several other intervals are obtained from these by inversion. It is evident that such intervals must belong to the same system, and must rest on the ratios of 2, 3, and 5. For inversion means

substituting for one of the two notes whose pitch is under consideration the octave of that note, and the change thus effected is expressed by halving the higher number of the ratio, or doubling the lower. Thus, the ratio of the minor third is 6 : 5, and the ratio of the major sixth resulting from its inversion is 3 : 5. The major third expressed by the ratio 5 : 4 becomes by inversion the minor sixth, of which the ratio is 5 : 8. The inversion of the tone gives the minor seventh, of which there are two forms corresponding to the greater tone and lesser tone; the ratio of one being $\frac{9}{16}$, and of the other $\frac{5}{9}$. The inversion of the octave gives an octave, and the inversions of the fifth and the fourth give respectively the fourth and the fifth.

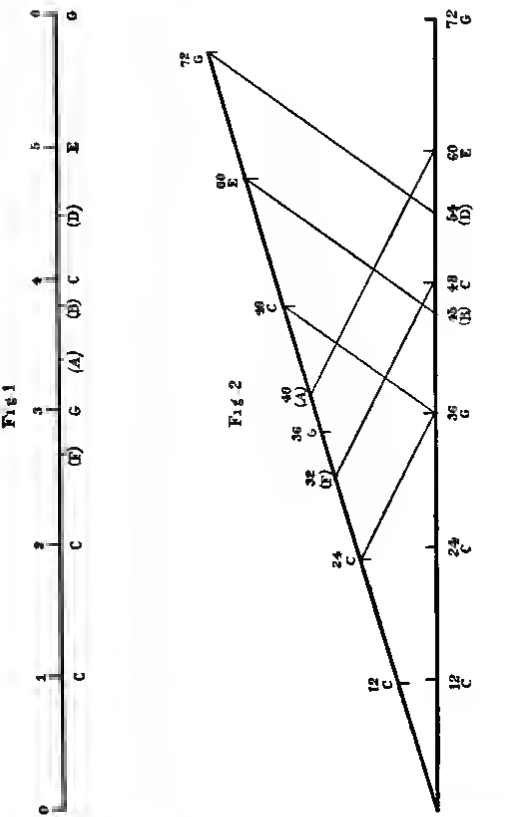
There are other intervals in the scale, intervals of which the ratios are more complex, but all accordant with the law that admits no factors but 2, 3, and 5. Such intervals are—

Imperfect fifth	—	64 : 45, that is $2^6 : 5 \times 3^3$.
Tritone	—	45 : 32, „ „ $5 \times 3^3 : 2^6$.
A minor third ($\frac{F \text{ to } D}{\text{in key C}}$)	—	32 : 27, „ „ $2^5 : 3^3$.

From the consideration of intervals we may now advance to the construction of the scale. The ratios of 2, 3, and 5 indicate three closely related notes; for if in some definite short space of time, say the sixteenth part of a second, a sounding body executes one vibration and gives forth a low note, say C, then another sounding body executing two vibrations in the same time will give forth a note an octave above this C; four vibrations in the same time are executed by a body giving forth a note an octave above the second C; three vibrations by a body sounding G, five vibrations by one sounding E. The vibrations 1, 2, 3, 4, 5, occurring in the same time, belong to notes constituting a common major chord. This fact may be represented graphically by a line divided into equal parts, of which each represents one vibration in the given time (*see* Fig. 1, p. 4).

If now a common chord with G instead of C for a bass be found, that is to say, if two notes be ascertained having the same relation to G that E and G have to C, the two notes thus found are B and D. And again, if a common chord be found in which the three notes occur in the same order as C, E, and G, but C occupies in the new chord the position occupied by G in the original chord, the three notes of the new chord are F, A, C. Thus all the notes in the scale of C are found. In the diagram, as the octave between 3 and 6 has three equal divisions, let three equal divisions be taken in the octave from 2 to 4, and by this means F and A are found. As at 3 G falls half-way between C and C, insert a note D half-way between G and G, and half-way between G and this new note put in B, just as E falls half-way between C and G.

This statement may be graphically expressed as follows (*see* Fig. 2) :—



Let the horizontal line have the same meaning as before, but to avoid fractions suppose the time in which the vibrations occur to be twelve times as long as before, so that each of the six original divisions represents 12 vibrations. Draw a similarly divided line making any angle with the other, and complete a triangle by joining the points C 48 and G 36. Lines drawn parallel to this third line will cut the two other lines proportionally. Lines so drawn from E and G will therefore give the places of B and D (45 and 54).

Similarly if C 24 and G 36 are joined, two parallel lines from C and E will give the places of F and A (32 and 40).

In this way the seven notes of the scale in consecutive order from F to E are obtained, the ratios of their vibrations being as follows—

32, 36, 40, 45, 48, 54, 60.

These numbers are all compounded of numbers belonging to the group 2, 3, 5. Expressed in terms of this group they are—

2^5, $3^2\times2^2$, 5×2^3, 5×3^2, 3×2^4, $3^3\times2$, $5\times3\times2^2$.

To express the scale from C to C it is necessary to take the octaves of some of the notes. The octaves below the notes represented by the three highest numbers must be represented by the halves of these numbers, and the order will be—

24, 27, 30, 32, 36, 40, 45, 48.

Expressed in terms of the series 2, 3, 5, the vibrations of these notes are—

3×2^3, 3^3, $5\times3\times2$, 2^5, $3^2\times2^2$, 5×2^2, 5×3^2, 3×2^4

From this it is evident that if the vibrations of C and its octave are expressed by the ratio 1 : 2, the vibration numbers for the several notes of the scale from C to C are in the following proportion :—

$1, \frac{3^2}{2^3}, \frac{5}{2^2}, \frac{2^5}{3^3}, \frac{3}{2}, \frac{5}{3}, \frac{5\times3}{2^3}, 2.$

In this statement it appears very clearly that only the ratios of 2, 3, and 5 are concerned in the relations of the several notes of the scale to each other. But it is advisable to express these fractions in a more familiar way, as follows :

$1, 1\frac{1}{8}, 1\frac{1}{4}, 1\frac{1}{3}, 1\frac{1}{2}, 1\frac{2}{3}, 1\frac{7}{8}, 2$

It must be borne in mind that the interval between two notes whose vibration numbers are to one another in the ratio of two fractions in this series cannot be adequately expressed by the difference of the two fractions. Thus the difference between 1 and $1\frac{1}{8}$ is $\frac{1}{8}$, but this does not express the relation between C and D. For in the next octave the vibration numbers of C and D are represented by 2 and $2\frac{1}{4}$, and the difference in this case is $\frac{1}{4}$ instead of $\frac{1}{8}$. Moreover, the difference which from one point of view is $\frac{1}{8}$, is from another point of view $\frac{1}{9}$, for the difference $\frac{1}{8}$ is one-eighth of the lesser quantity 1, but it is one-ninth of the greater quantity $1\frac{1}{8}$. The fundamental way of regarding the interval is to regard it as depending on a ratio of vibrations, the ratio of the

vibrations of D to those of C being 9 to 8. Looked at from this point of view the intervals in the scale of C from each note to the next, step by step, are indicated by ratios as follows:—

C to D, 24 : 27 = 8 : 9.
D to E, 27 : 30 = 9 . 10.
E to F, 30 : 32 = 15 : 16.
F to G, 32 : 36 = 8 : 9.
G to A, 36 : 40 = 9 : 10.
A to B, 40 : 45 = 8 : 9.
B to C, 45 : 48 = 15 : 16.

It thus appears that the intervals of the second are of three magnitudes. Between E and F the ratio is 15 : 16, as also between B and C, and the interval indicated by the fraction $\frac{15}{16}$ or $\frac{16}{15}$ is the semitone. Between C and D, as also between F and G, and between A and B, the ratio is 8 : 9, and the interval indicated by $\frac{8}{9}$ or $\frac{9}{8}$ is the greater (major) tone. The third magnitude is the ratio 9 . 10 between D and E, and between G and A, and the interval indicated by $\frac{9}{10}$ or $\frac{10}{9}$ is the lesser (minor) tone. The order in which these intervals appear in ascending from C to C is—

Greater Tone, Lesser Tone, Semitone, Greater Tone, Lesser Tone, Greater Tone, Semitone.

In a rude way these intervals may be approximately compared by means of fractions, thus: if by $\frac{1}{8}$ we agree to understand $\frac{1}{8}$th of the vibration number of the lower of two notes we may say that the note which is a lesser tone above it is sharper by $\frac{1}{8}$th; or, if by $\frac{1}{9}$ we agree to understand $\frac{1}{9}$th of the vibration number of the higher of two notes, we may say that the note which is a greater tone below it is flatter by $\frac{1}{9}$th. On the first understanding the tones and semitones in the ascending scale will appear as—

$\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{15}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{8}$, $\frac{1}{15}$

On the other understanding they will appear as—

$\frac{1}{9}$, $\frac{1}{10}$, $\frac{1}{15}$, $\frac{1}{9}$, $\frac{1}{10}$, $\frac{1}{9}$, $\frac{1}{15}$.

These statements bring out in a rough way the inequality of the greater and lesser tones, and show that the semitone is greater than the half of either tone, but the fact that the two inconsistent statements are equally tolerable is enough to show that they are both untrue.

In order to express intervals satisfactorily, we require a notation by which any number of intervals that together make up some greater interval may be expressed by a series of numbers, the addition of which will result in a total that will consistently express the greater interval. While our only consistent method of indicating intervals is the employment of ratios, we must multiply the ratios proper to the lesser intervals to obtain a consistent expression for the greater interval which together they make up.

For example, a greater tone, a lesser tone, and a semitone occupy the whole interval from C to F, which is the interval of a fourth. The ratios proper to the three constituent intervals are respectively $\frac{8}{9}$, $\frac{9}{10}$, and $\frac{15}{16}$, and the ratio proper to the whole interval (the fourth) is $\frac{3}{4}$. The product of the three smaller fractions is the greater fraction ($\frac{8}{9} \times \frac{9}{10} \times \frac{15}{16} = \frac{3}{4}$). Again, the ratio of the vibrations of the upper to the lower note at an interval of an octave is 2 : 1, and this is the product of the ratios of all the separate intervals in the scale ($\frac{8}{9} \times \frac{9}{10} \times \frac{15}{16} \times \frac{8}{9} \times \frac{9}{10} \times \frac{8}{9} \times \frac{15}{16} = \frac{1}{2}$).

Every one that is familiar with the theory or with the use of logarithms will see at once that, in order to obtain expressions for these intervals of such a nature that addition may be substituted for multiplication in the compounding of intervals, we have only to substitute for the ratios the logarithms of those ratios and the problem is solved. For this purpose any system of logarithms will answer, the common system of logarithms to base 10 as well as any other.

In the common system of logarithms the logarithm of 2 is ·3010300. If this number is taken to represent the interval of an octave, then the logarithms of $\frac{8}{9}$, $\frac{9}{10}$, and $\frac{15}{16}$ will represent the intervals of the greater tone, lesser tone, and semitone respectively. These logarithms are—

Log. $\frac{8}{9}$ = ·0511525.
Log. $\frac{9}{10}$ = ·0457575.
Log. $\frac{15}{16}$ = ·0280287.

From this it appears that if the octave is represented by a line 301 inches in length, the greater tone is about 51 inches, the lesser tone about 46 inches, and the semitone about 28 inches. Three greater tones (153), two lesser tones (92), and two semitones (56) make up the octave (301). These numbers are only approximately proportional to the logarithms, and the logarithms themselves are only approximately correct, and would be only approximately correct if they were carried to any number of decimal places beyond the seventh, which is the last here given.

With the human voice or on any stringed instrument a skilful artist can render the intervals more correctly than any logarithmic expressions can indicate them. But on a keyed instrument tuned to suit fifteen major and twelve minor keys and having only twelve notes in the scale, it is impossible to perform with correct intonation. To say that an instrument is equally adapted to all these cases is in effect to say that it is equally unrelated to them all. If the octave, represented by the logarithm ·3010300, is divided into twelve equal intervals called semitones, each of these is represented by ·0250858, whereas the true semitone is represented by ·0280287. The tempered semitone therefore is about $\frac{25}{28}$ths of a true semitone, and the tempered tone (·0501717) is about $\frac{25}{28}$ of the greater

tone, and about $\frac{2}{3}$ths of the lesser tone. Of the intervals of the tempered scale the fifth and the fourth (which is the difference between the fifth and the octave) approximate most nearly to the corresponding intervals of the true scale. The true fifth is sharper than the tempered fifth (and the true fourth flatter than the tempered fourth) to the extent of about $\frac{1}{114}$th of an octave, the fraction being very nearly $\frac{1}{113\frac{1}{3}}$. The difference is represented by the ratio of $\frac{886}{885}$, that is to say, if a monochord is divided by a bridge in such a way as to have 885 equal parts on one side of the bridge and 886 equal parts on the other side, the difference of pitch between the two lengths of the string is the correction a tuner has to make after he has obtained G as a true fifth from C, this correction being made for the sake of equal temperament. If the octave is represented by the logarithm of 2, that is, by ·301029995664, this difference is ·000490428252.

The errors of the notes of the tempered scale may be very conveniently expressed in terms of this small quantity taken as a unit. Taking the tonic of any key as the standard of comparison for the other notes and using the sol-feggio syllables we may state the errors of the notes of the tempered scale as follows:—

Re	—	2 units flat
Mi	—	7 units sharp
Fa	—	1 unit sharp
Sol	—	1 unit flat
La	—	8 units sharp
Si	—	6 units sharp

Since the unit is about the 614th part of an octave, and the tempered semitone is therefore equal to about 51 units, it appears that the error of La is about the sixth or seventh part of a semitone, an error of too serious a magnitude to be disregarded, and the errors of Mi and Si are not much less considerable.

The amount of error as stated above is absolutely correct for Fa and Sol, and also for Re, but it is slightly inaccurate for Mi, La, and Si, the extent of the inaccuracy being exactly the same for each of these three notes. This error is remarkably small, being only about $\frac{1}{18}$ths of the millionth part of the octave. The comma, the difference between the greater and lesser tones, and corresponding to the ratio $\frac{81}{80}$, is greater than eleven units by ·000000321116 if the octave is ·301029995664, and this difference is the only correction that is required to make the foregoing statement of the errors of Mi, La, and Si perfectly accurate.

The question now arises—what number of notes within the compass of an octave must a keyed instrument have in order that within the limit of error last stated (rather more than the millionth of an octave for each of three notes in every

scale) it may be possible to play fifteen true major scales and fifteen corresponding minor scales? The number required is 52, more than four times the number now in use.

In passing from the key of C into the key of G it is not enough to substitute F♯ for F. It is necessary to alter A also, for in the scale of C the note A is a lesser tone above G, while in the scale of G the note A must be a greater tone above the tonic. Similarly, if the modulation is from the key of C into the key of the subdominant, it is not enough to substitute B♭ for B; the D also must be changed, so that between it and the unchanged C there may be a lesser tone instead of a greater tone. Thus (without taking minor keys into account for the present) to the seven notes of the scale of C must be added two new notes for every new key ascending by fifths, and two new notes for every new key descending by fifths, or twenty-eight new notes in all, bringing up the number to thirty-five. Seventeen other new notes are required as sharp fourths and fifths of major scales to be used in the relative minor scales. These notes must be regarded as intended to divide the interval between Mi and La in the same way as the sixth and seventh divide the interval between Sol and Do. The errors of these notes in the tempered scale are exceedingly large, amounting to 16 units and 14 units respectively, and it should be remembered that 16 units is nearly a third of a tempered semitone (51·15 units). The La is, as has been stated, 8 units sharp, and the semitone between it and the new leading note is in the tempered scale 6 units smaller than a true semitone, so that the whole error of this leading note is 14 units; and the tempered tone is too small by 2 units for the greater tone which is required between the two sharps, so that the error of the lower of the two sharps is 16 units. Of the seventeen new notes required for minor scales the three middle scales (F, C, and G major) require five—viz., F♯ and G♯ for C, C♯ for F and G, D♯ for G, and B♮ for F. Every other key requires two notes of this class, but only one of the two is original to each key, the other two being borrowed from a key nearer to C. These seventeen notes bring up the number to 52.

Of these 52 notes, three notes belonging to minor scales may be dispensed with—viz., C𝄪, G𝄪, and F made natural from F♯, seeing that the minor keys in which alone they occur are not in use. It is, however, convenient to show their places in a general scheme, and the scheme gains in consistency by taking them into account.

Moreover, 17 other notes out of the 52 are of very little value, because each of them lies very close to a companion note that must find a place in the scale. The difference between such a note and its companion is exactly one unit, the smallest error in the tempered scale, being the 51st part

of a tempered semitone. Such a note is F flat, which differs by a unit from its companion note, E. If these notes are disregarded there are (52 less 17) 35 notes required instead of the 12 generally recognised, that is, three notes for every existing note with the exception of one, and two notes for that one. The one exception is B♭ or A♯, for which two forms instead of three will suffice if the small distinction between a note and its companion note is disregarded.

The three forms of each note are—a middle form, a grave form, and an acute form; the interval between the middle form and either of the others being a comma, the interval corresponding to the ratio $\frac{81}{80}$, and containing about 11 units, or about a fifth of a true semitone. The interval therefore between the gravest and the acutest form of the same note is 22 units, or nearly two-fifths of a true semitone (and more than two-fifths of a tempered semitone), or three-fifths of the difference between a major third and a minor third. The extreme forms of G♯, for example, are 22 units apart, and the acutest form of G♯ is actually 23 units above the gravest form of A♭.

It will be more satisfactory to provide for 52 notes than for 35, and if every couple of companion notes (such as G♯ and A♭) is to be split up into its two separate notes, while we still regard these separate notes as forms of one note of the series of twelve in a keyed instrument, we shall require for some notes of the keyed instrument five forms and for others four.

As the place of each note is to be indicated by its distance in units from the note which represents it in a system of equal temperament, it is necessary to assume one note as being in unison with the corresponding note of the tempered system. The most convenient note for this purpose is E, because the discrepancies between the true and the tempered systems are equally balanced on both sides of that note, the extreme case of flattening (to the extent of 16 units in D♯ as a tonic) and the extreme case of sharpening (to the extent of 16 units in F♮ in a minor key) being cases of equal error.

The following table shows, opposite to the name of each note of a keyed instrument, the several notes which that note has to do duty for, and the number of units by which it requires to be raised or depressed to represent each of those several notes accurately, the signs + and — being used for necessary sharpening and flattening respectively. The middle form of E being made to accord perfectly with that note on a keyed instrument, the acute form of E is to be obtained by means of a monochord divided by a bridge into two parts in the proportion of 80 to 81, and tuned so that the longer part shall give E in unison with the E of the keyed instrument; the shorter part will give the acute E, sharper

than the other by a comma. By a similar process the grave form of E, flat by a comma, is to be obtained. All the other notes are to be obtained from these by fifths ascending or descending. The grave E is E natural, made natural for the purposes of a minor key, and from it are obtained 11 notes by fifths ascending, the last of the 11 being G𝄪, and 5 notes by fifths descending, the last being F𝄫. All these notes are notes required only in minor keys, and they are indicated in the table by being enclosed in brackets. Not only does the number against each note indicate the number of units by which that note differs from the corresponding note of the keyed instrument, but also the difference between this number and the number proper to the E from which the note is derived shows at how many removes by fifths the note lies from E.

From the acute form of E are derived 5 notes by ascending fifths to D♯, and 12 notes by descending fifths to F♭. Every note used in a major scale as a tonic or as a dominant or subdominant or as the second note of the scale, and these same notes when they occur in the relative minor scale, must be chosen from this set of notes, and except in such relations the notes of this set are not to be used. The notes of this set are marked by square brackets.

The rest of the notes are derived from the middle form of E, by fifths ascending (eight times) to B♯, and by fifths descending (eight times) to A♭.

TABLE OF 52 NOTES TO THE OCTAVE.

	Grave.		Middle.		Acute.	
C	(C♮ − 15)		C − 4	(B𝄪 − 3)	[C + 7]	B𝄪 + 8
B		(B♮ − 10)	[C♭ ±0]	B + 1		[B + 12]
B♭	B♭ − 6	(A𝄪 − 5)	[B♭ + 5]	A𝄪 + 6		
A	(A♮ − 12)		A − 1	(G𝄪𝄪 ±0)	[A + 10]	
G𝄪	A♭ − 8	(G𝄪 − 7)	[A♭ + 3]	G𝄪 + 4		[G𝄪 + 15]
G	(G♮ − 14)		G − 3	(F𝄪𝄪 − 2)	[G + 8]	
F𝄪		(F𝄪 − 9)	[G♭ + 1]	F𝄪 + 2		[F𝄪 + 13]
F	(F♮ − 18)		F − 5	(E𝄪 − 4)	[F + 6]	E𝄪 + 7
E		(E♮ − 11)	[F♭ − 1]	E ±0		[B + 11]
D𝄪	E♭ − 7	(D𝄪 − 6)	[E♭ + 4]	D𝄪 + 5		[D𝄪 + 16]
D	(D♮ − 13)		D − 2	(C𝄪𝄪 − 1)	[D + 9]	
C𝄪		(C𝄪 − 8)	[D♭ + 2]	C𝄪 + 3		[C𝄪 + 14]

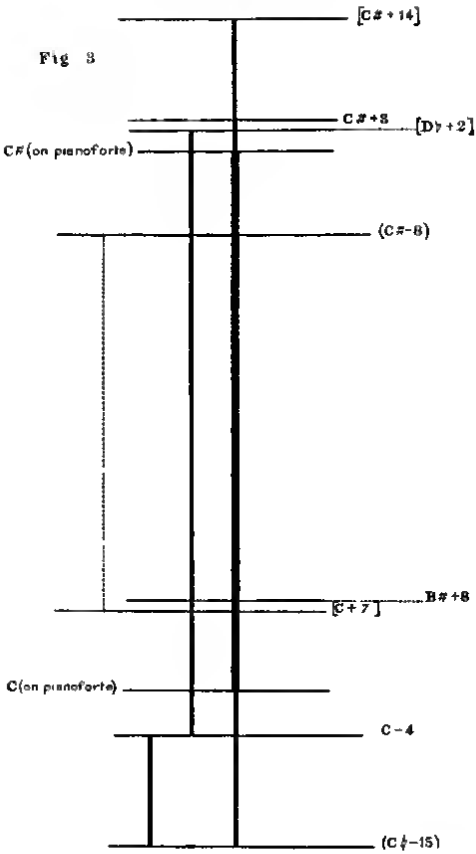
The accuracy of this table may be tested by selecting from it the notes belonging to any one scale, and seeing whether the numbers expressing the distances of the several notes from the corresponding notes of the equal temperament scale are consistent with the statement that has been made of the amounts of error of the several notes of the equal temperament scale. According to that statement the errors of the equal temperament require the following corrections, if the error of Do is assumed to be nil:—Re+2, Mi−7, Fa−1, Sol+1, La−8, Si−6. Therefore if in the scale of C the keynote has for its number of units of error, +7, the number shown in the table, then the numbers for the other notes of the scale in order ought to be the numbers arising from the addition of 7 to the numbers just assigned to Re, Mi, Fa, &c. The numbers so arising are as follows: +9, +0, +6, +8, −1, +1. It will be found on inspection that these are the numbers given in the table for [D], E, [F], [G], A, and B, respectively. Similar results will attend a similar test applied to the other scales, if it is borne in mind that in every scale Do, Re, Fa, and Sol must be selected from the notes marked with square brackets.

In the following diagram (Fig. 3, p. 13) the inadequacy of the system of equal temperament and the character and extent of its errors are illustrated in a visible form. The perpendicular heavy line represents a semitone of the equal temperament scale, from C to C♯. The faint lines in continuation of it show the extent to which the portion of the octave included between this C and this C♯ must be expanded, as it were, to make it include the places of all the notes for which these two notes have to do duty. The horizontal lines show (by their intersections with the perpendicular) the places of all the forms which C and C♯ justly assume in the course of modulation with true intonation. As the octave is equal to about 613·8 units, the heavy line for the equal temperament semitone represents 51·15 units.

The line drawn from [D♭+2] to C−4 represents a true major semitone. It is so placed as to be readily compared with the heavy line which represents an equal temperament semitone. The dotted line from (C♯−8) to [C+7] represents a minor semitone. The line drawn from C−4 to (C♯−15) represents a comma. The interval between C♯+3 and [D♭+2] is the unit of which so much use has been made in this paper, as also is the interval between B♯+8 and [C+7].

The advocates of equal temperament are accustomed to regard as insignificant the errors of which the nature and magnitude have been thus exhibited. It may be doubted whether they have ever adequately understood the extent to which the errors reach, and the degree in which voices and

Fig 3



stringed instruments are compelled to depart from true intonation under the tyranny of the pianoforte and the modern organ.

No doubt the complexity of a keyed instrument made to satisfy the demands of just intonation must be very great. Even if the difficulties of manipulation were reduced to a minimum by means of a moveable keyboard, which would lend itself to the application of the Tonic Sol-fa notation to music for the pianoforte and organ, the great number of strings or pipes would constitute a great difficulty with respect to construction and to expense. But unless difficulties of this kind can be surmounted it is to be hoped that a study of the true relations of the notes of the scale in melody and in harmony will lead to the cultivation of vocal and orchestral music, and of music of every kind for stringed instruments, in ways that will render them independent of the pianoforte and organ.

NOTE.—In this paper the fullest deference has been paid to the consensus of authorities by which the place of the supertonic is fixed at a greater tone above the tonic. According to this rule the interval between the tonic and the mediant is divided into a greater and lesser tone, the greater tone coming first in the ascending order. It is a question worth considering, however, whether this rule is without exception. It has the merit of exhibiting a certain symmetry in the order of the vibration numbers, inasmuch as if the numbers for the tonic and mediant are 24 and 30, the number for the supertonic is by this rule 27 and falls exactly midway between 24 and 30. But the relations of the supertonic with some other notes of the scale are not of the best if this rule is absolute. It is impossible to have a D which is at the same time a fifth above G and a fifth below A. Are there not occasions when the supertonic and the submediant ought to be separated by an interval of a true fifth, that is to say, are there not occasions when the graver form should be substituted for the acuter form of the supertonic? Is there not sometimes a slide made from one form to the other in artistic vocalisation? And in the key of A minor does it not seem desirable to have a note in the scale a true fourth above and a true fifth below A? It is remarkable that the graver form of the supertonic is given by a process very similar to that by which the acuter form is found, the difference of process being that lengths of string are considered instead of vibrations.

It will be remembered that the relations of C, E, G, having been determined by the ratios of their vibration numbers, which are as 4, 5, and 6, the other notes of the scale were found by constructing two chords similar to the chords C, E, G, one chord beginning with G as its lowest note and the other

ending with C as its highest note. Now, if lengths of string are considered, lengths 6, 5, and 4 are the lengths of three notes forming a minor chord, A, C, E. If the lowest of these notes be made the highest of a similar chord, and the highest of them be made the lowest of another similar chord, the new chords are—first, D, F, A; and second, E, G, B. The D found by this process is the graver D, flatter by a comma than the recognised supertonic in the major key of C. With respect to length of string, this note exhibits the same kind of symmetry as the other D exhibits with respect to vibrations, that is, it lies just half-way between C and E. If the lengths for C and E are 30 and 24 (as 5 to 4), the length for grave D is 27, the length for acute D is $26\frac{2}{3}$, and the ratio of the two forms is 81 : 80, the ratio of the comma. There is a strong temptation to argue that as the string is in the order of nature and time before the vibrations which are only affections of the string, a scale derived from a consideration of the symmetry of the proportions of lengths of string has an *a priori* claim to regard. The answer, of course, is that the phenomena of sound do not emerge until vibrations are set up, and that the vibrations therefore deserve the chief consideration.

It is, however, interesting to observe that from the simplest relations of string lengths the chord first derived is the minor chord, and that, as if with an appreciation of that fact, the author of our musical notation gave a singular prominence to the minor relations of the scale by using the first letter of the alphabet, not for the tonic of the open major scale, but for the keynote of the open minor scale; and it is also interesting to observe that, if the grave supertonic is adopted, the intervals of the major scale expressed in lengths of string afford a singular apparent justification for the use of the terms tone and semitone. Thus, if 60 parts of a string give C, the parts cut off successively in a diatonic ascent to the octave are—

$$\underline{6,\ 6,\ 3,}\ \ 5,\ \ \underline{4,\ 4,\ 2.}$$

In this succession of intervals, such a group as 6, 6, 3, or 4, 4, 2, appears to warrant the recognition of the first two intervals in the tetrachord as equal intervals, and the next interval as exactly the half of either of them. It is to be observed also that with this construction a scale has two exactly similar tetrachords, 6, 6, 3, and 4, 4, 2; and that these are separated by a tone exactly intermediate in value between 6 and 4. Are such considerations as these to be altogether ignored? Does it not seem that there ought to be some scientific recognition of a kind of elasticity about the supertonic, or of a necessity for two forms of it? From this point of view it may be necessary to modify the rule of

selecting supertonics from the set of notes from which tonics, dominants, and subdominants must be selected; in that case a new note must be added to the table—viz., D♭ −9 for occasional use in the key of C7.

NOTE 2.—The ordinary logarithms to seven places are not quite full enough for the investigation of this subject. The logarithms of 2, 3, and 5 to 12 places are therefore given here:—

Log. 2 = ·301029995664.
Log. 3 = ·477121254720.
Log. 5 = ·698970004336.

With ·301029995664 for the interval of an octave the most necessary logarithms deduced from the above are—

12th of an octave	—	·025085832972.
True Semitone	—	·028028723600.
Minor Tone	—	·045757490560.
Major Tone	—	·051152522448.
Comma	—	·005395031888.
Unit	—	·000490428252.

DISCUSSION.

THE CHAIRMAN.—Ladies and gentlemen, I am sure you will all be agreed that we have listened to a paper which represents an immense amount of study, thought, and calculation; but I think we shall all be agreed it is one of more interest to scientists than to practical musicians. Before discussing this point, however, I think we should record a vote of thanks to the writer of the paper. [The vote was passed unanimously].

MR. HERBERT.—I came here this evening imagining that an attack would be made on equal temperament, and, having had a great deal to do with it for the last thirty odd years, I wished for the opportunity of giving my experience on the subject. I will not enter into the circumstances which led me to take charge of the Roman Catholic choir in Farm Street, I only tell you I did so in September, 1852, and that my first step was to have the organ re-tuned equally by Messrs. Hill. I was totally alone, everyone was against me, and I was about the best abused man in London for some time. All the builders opposed me, and the organists mostly did not know much about it. My own master, George Cooper, one of the best players and best masters that ever lived, came to try the organ, and was so pleased that he had his own at Christ's Hospital tuned equally also. Shortly after that I presume Sir John Goss went to hear the Christ's Hospital organ, and the consequence

of that was that St Paul's was tuned equally. I met old Mr. Bishop in the street very shortly after St. Paul's had been tuned, and I said: "Well, Mr. Bishop, I hear you have tuned St. Paul's equally." "Yes," he said, "we have, and I am bound to say the more I hear it the more I like it; and at the same time," added he, "I think they sing better in tune.' Now, here was a man over seventy years of age, who had done nothing all his life but tune perfect thirds and flat fifths, and heard nothing else, and yet that was his opinion to me. Another striking anecdote is this from Dr. Hopkins, who told it me himself. When he and Mr. Rogers, of Doncaster, went abroad to gather materials for their great work on the organ they took letters of introduction everywhere, and went to compare the organs and stops with those at home. Hopkins said: "Rogers, that is our diapason, that is our principal, that is this and that, but somehow it sounds different; I like it, Jerry" (Rogers' name was Jeremiah), "don't you?" and Jerry said he did. After some time Hopkins said, "What if it should be the temperament after all?" Now I will tell you on what grounds I defended the equal temperament. The old mean temperament had what was called a *wolf;* it had many wolves, but the special wolf was that sharp 5th in four flats—*i.e.*, A♭ and E♭, which rendered the key horrible; the third, A♭ and C, was also insufferable; and so the key of four flats was almost tabooed on the organ, though Bach wrote one Fugue in F minor for it. Accordingly what I had to combat was a temperament where, in the good keys, C, G, D, and so on (I ignored the wolves), the thirds were perfect, or nearly so, the fifths very flat (¼ of a comma), and the fourths equally sharp. Now, I said, I take you on your good keys, and I maintain that your diatonic scale, the Doh, Rey, Mi, Fa of the Tonic Sol-fa people, is something so vile, so bad, that no singer and no violin or cello player would tolerate it for a moment. My own master, the late Mr. Hancock, always used to abuse the organ, and declare it was never in tune. He did not mean the wolf, he meant the organ generally. Of course the thing cannot now be heard, but in those days it could, and if you compared the diatonic scale of the good keys in an organ tuned on the mean temperament with an organ tuned on the equal temperament, there could be but one opinion as to which was the best. On one occasion, when I had an organ tuned equally, I left the choir unequal, then called the clergy up into the organ loft, and without telling them which was which I said: "Fathers, I will play the same passages in harmony and melody on the two rows of keys, and you shall tell me which you like best." They said, "We like *that* the best"—they could not tell why, but they said it was more musical. Another curious experiment was tried that morning. I took

a mixture of 3, 5, 8 (of course they were tuned perfectly), I then drew a principal in the choir and played the same notes in a succession of chords, and let them hear the difference between those with mathematically perfect intervals and tempered ones, and the difference was very peculiar. In the perfect intervals we took scarcely any cognisance of the notes themselves, they sounded like one note, whereas in the tempered intervals you heard the parts distinctly, and I suggested at the time that it might be on that account that the equal temperament in part-music on the organ was more agreeable. In those days of the mean temperament, organists were taught to, and as a matter of fact did, play as full-handed as possible. With the introduction of the German organ with the 16-ft. stop on the manuals and German music generally, organists had to learn to play in parts, not less than four generally, if they could in five, and so on, so that it was part playing and no longer playing handfuls of notes. If you want to see what organ arrangements were in those days look at Dr. Crotch's arrangement of the Amen Chorus, a piece he was very fond of giving to those who came to him for a testimonial. That is one reason why I think the equal temperament now seems far more acceptable than it would possibly do in those days. Then came another question about the mixtures. Hill's partner said, Mr. Herbert had spoilt the Farm Street organ: "What do you do with the mixtures?" I said "I do not know; I suppose you tune them perfect." Will it be believed, Helmholtz in his magnificent work on Musical Acoustics talks of the infernal noise (Höllenlärm) made by the mixtures in equal temperament? Almost all the mathematical musicians, or musical mathematicians, I do not care which, seem to have gone crazy on this point. I have brought with me the most learned of all the books I know on the subject, Colonel Perronet Thompson's "Treatise on Just Intonation," and you can see for yourselves what he proposed to do to play perfectly in twenty keys. There are three manuals, not as in an organ, but simply to play in different keys. There is one point in the paper which I should like to allude to, where the writer speaks of the second of the scale. Colonel Thompson entitled that book in the first edition, "The Duplicity of the Dissonances." One dissonance was the second of the scale, and he showed that that note cannot be in tune with the dominant and subdominant both. All subdominant harmonies require the flat form of the supertonic or the minor tone, and all dominant harmonies require the major tone. Well, as I said at the time, what are you to do in a very common harmony indeed to the supertonic—namely, a $\frac{6}{4}$ upon F say, followed by the common chord or the seventh on G? In that case four perfect voices would raise the supertonic one comma, you would get the two

forms of the supertonic perfectly distinct—first of all the flat form, and then the other. As to the possibility of introducing additional notes or keys to keyed instruments, Colonel Thompson's is one form. Mr. Bosanquet, whom I believe you have heard here, has invented and had built another, which is, I believe, at Oxford. A clergyman, the Rev. Henry Liston, constructed another, which was thought a good deal of; he, I think, made the changes with a pedal. Helmholtz himself has invented one; but I must ask you, gentlemen, whether, in the present state of pianoforte and organ playing, it is practicable to add notes to those already existing? To return to equal temperament, I have been at it half my life. Here is a table of intervals which I copied out fifty years ago. There are the compositions of 2, 3, and 5, really copied out of Rees's Cyclopædia, and this has been my gospel about temperament ever since. In 1852, when I had that fight with the old temperament, I drew up a table showing the errors of both systems. In the equal temperament, the third is certainly very sharp, the fifths and fourths are nearly perfect, the sixth is sharp, the minor third is very flat. Granted; but now we come to a very curious thing. There is a tendency in violin players to sharpen certain notes and to flatten others. Almost all violin players make the third and seventh sharper than the mathematical note, and in the case of flats, for example, in the key of E♭ they will make E♭ lower than D♯. It ought not to be so, but they generally do it. Dr. Pole alludes to it in that very charming book, "The Philosophy of Music," and in this equal temperament it is a singular thing that all the notes that first-rate players are inclined to make a little sharp are already a little sharp, and those notes which players, and singers too, are inclined rather to humour and make a little flat, are already a little flat. I remember the Temple organ in the old days when it had the so-called quarter-tones. Of course they were not quarter-tones, or anything of the sort; what was there was this: the key which usually represents D♯ and E♭ was divided into two, and the key which represents G♯ and A♭ was also divided into two, and one was a little higher than the other—I forget which was which. As the tuner had not got the fear of the wolf before his eyes, because on the Temple organ you could play in four flats perfectly well, he tuned the major thirds absolutely perfect, and the consequence was the diatonic scale in the good keys on the Temple organ was worse than ever, and about the worst that ever was heard. As soon as Dr. Hopkins came there he did all he could to get equal temperament introduced, and to get those quarter-tones abolished; but the old Benchers were very proud of their organ, and thought them very fine. After a time Hopkins had the organ tuned equally, but let the

quarter-tones remain, so that the good Benchers imagined they still had their old friends; but at last they were abolished, and now it is all equal together.

Mr. Blaikley.—I have had an opportunity of reading this paper of Mr. Habens', otherwise I should certainly not attempt to take up your time, for I think it is not one that can be considered just on the first hearing. What I should wish to say will not be in the way of criticism of this particular paper, setting forth Mr. Habens' view, for I do not think that can be profitably entered upon at such short notice; but I differ a little from Mr. Herbert, who has put the present position of equal temperament and the real idea of it before us. I think the subject brought forward should be regarded in the first place from the scientific and artistic point of view. I couple the two together, taking them as standing in opposition to the merely utilitarian point of view of the possibility of mechanical construction, or the cost of instruments, and so forth. It appears to me that when we are dealing with any matter of artistic or scientific theory we may eliminate from our consideration altogether, if we hold up the principles of art or science, practical questions of cost or mechanism; they can come afterwards and qualify the results otherwise obtained. It appears to me that to force the theory of musical intervals and harmony into an agreement with the equal tempered scale of twelve semitones is contrary to the scientific point of view, and it seems to me it is as contrary and as wrong to attempt such a forcing as it would be to force, let us say, the theory of the prismatic spectrum, or the art of painting in water or oil colours, to fit in with the number of pigments which the chromo-lithographer can practically use, and which, for the sake of analogy, we may assume to be twelve. Therefore, I think it is worth while for an Association like this to have such questions brought before it from time to time, to be viewed simply from the artistic and scientific point of view. I was a little struck (but possibly Mr. Habens' desire to keep the paper within reasonable limits may be the reason for it) with the omission of any reference to the work already done in this matter. Some instances were quoted by Mr. Herbert, and particularly Mr. Bosanquet's instrument. There is also an instrument, not so ambitious in its character, by Mr. Colin Brown, Ewing Professor at the Andersonian University, Glasgow. The distinction between the two chief systems proposed for practical work with respect to an approximation to the theory of the intervals of the scale in just intonation is, as you know, that one is cyclic, of which the division of the octave into twelve equally tempered semitones is an example; and the other system makes no attempt at dealing with keys in a cycle; of this Mr. Brown's instrument is an example. It is

now some years since he showed and explained to me his instrument, but my remembrance of it is that the volume, power, and purity of tone of the chords, due to the tuning in just intonation, was something marvellous when compared with the ordinary results obtained from a single set of reeds on the common harmonium. Of course, in cyclic systems we have to consider some practical limit of accuracy. In the system proposed by Mr. Habens, the difference known as the schisma, which is that between the equally tempered fifth and the true fifth, in the ratio of 3 to 2, is used as a unit for comparing errors. This very slight difference is not very material, as we have it on the ordinary tempered instrument. It is not material on the fifths and fourths, but the thirds and sixths are very far from being harmonious when sounded in sustained chords I did not quite gather from Mr. Habens' paper whether the system suggested by him is a cyclic system or not; I think it is not, but simply a modification of Mr. Colin Brown's system, as it were. I would say a word with respect to what is commonly understood as the natural scale, or the scale of nature. We are commonly informed that the basis for that term is to be found in the fact that a cylindrical tube will give forth tones in harmonic succession, and a stretched string also; but we must remember that neither cylindrical tubes nor stretched strings are at all natural objects. Therefore we should have some other basis for the term, the natural scale. I think the true basis is to be found in the nature of any powerful tone. When it is resolved into its component parts they are found to be in the harmonic scale, as you all know. Now with respect to the intervals in the diatonic scale we are usually told that the semitone in the ratio of $\frac{15}{16}$ is the natural semitone. I cannot find any sufficient reason for calling that interval a natural semitone; it is no more natural than the ratio $\frac{16}{17}$ or $\frac{17}{18}$. Indeed, these two as dividing the major tone from 8 to 9 have a better title to the name of semitones than the ratio of $\frac{15}{16}$, which does not divide a tone of any kind, major or minor. Then with respect to the scale as a whole, F, the subdominant in the key of C, cannot be derived from the natural harmonic series. If we take the natural harmonic scale with vibrations in arithmetical progression from 1 upwards, it is evident that no addition or multiplication or subtraction of whole numbers can give us a number comprising a fraction such as the subdominant of the scale must include if we take the tonic as being 1, 2, 4, and so on. Therefore, the subdominant is really foreign to the natural harmonic scale. Should we not therefore rather view the diatonic scale as a combination or an interweaving for artistic purposes of elements drawn from two harmonic scales? It appears to me that that is the simplest way to build up theories concerning

the diatonic scale, and from this point of view it follows that the germ, as it were, of all transitions and modulations, either through the dominant or subdominant, is inherent in the scale as thus formed from elements chosen from two harmonic scales. Also we get that variation in the pitch of the supertonic of the D, which has been alluded to in the paper. If we have it as part of the scale of the subdominant F it is certainly a comma flatter than it is if viewed as part of the scale of C, and if we look upon the scale of C as an interweaving of the harmonic scale in C with the harmonic scale in F, by choosing elements out of each of those two scales we shall have the D in its two forms.

Mr. Wesché.—It may be interesting to know that the late Dr. Sebastian Wesley always insisted on his organ being tuned in the old mean temperament. This was told me by the organ builder, Mr. Bryceson. He said that he had considerable trouble at the Victoria Rooms, Bristol, and with the Gloucester organ on that account. I have asked practical musicians that have tried these organs of Perronet Thompson, and other people, and from what I could make out the result was confusion.

Mr. Herbert.—Did Dr. Wesley never come round to equal temperament?

Mr. Wesché.—No.

Mr. Herbert.—I thought as much. I may perhaps say one word more that occurred to me. Does anyone believe that in an orchestra where there are ten or twelve first fiddles, and all the rest in proportion, all these mathematical intervals are used—or in a chorus? The thing is simply impossible. It is all very interesting, but, as applied to keyed instruments, of no practical use. Four voices, if they are very well trained, may, and possibly do, sing mathematically correct. It is quite possible to write a melody or a harmony of such a nature that if the intervals are sung perfectly correctly the singers are bound to rise or to fall. If the melody or harmony has a preponderance of ascending fifths or descending fourths they will rise, and if it have a preponderance of descending fifths and ascending fourths they will fall. But they do not fall if they sing well. The Leeds singers did not fall, and the Bach Choir at the last Concert sang an unaccompanied Motet of Bach's and they did not fall. Then comes the question—how do good singers and good players temper themselves; how do they prevent this falling? At Farm Street every year during Lent we had to sing what are called Lamentations, which is done entirely without accompaniment by single voices, and the Cantor—a most excellent singer—and I used to take them alternately. He could not make out how it was that he used to sink and I did not. I told him he always took the second of the scale too flat. If you take the

second of the scale always in the sharp form you can keep up.

Mr. Blaikley.—I should like to add with reference to the remark about just temperament in an orchestra, that I believe, as a matter of fact, we do get much nearer just intonation than we do to equal temperament in the orchestra. I cannot speak with respect to stringed instruments from any special knowledge, but with respect to wind instruments they are so much under the power of the lip that the slight difference of a comma can easily be made, and I should imagine that if a tonic and dominant were played, and the flute or clarinet player had to put in the third to complete the chord, he would naturally put it in just intonation; in fact, he could not hold it in tempered intonation.

Mr. Wesché.—There are constantly intervals written quite incorrectly for instruments in the orchestra on the old mean temperament.

Mr. Herbert.—Do you know, by the way, that Wheatstone's concertina for twelve or fifteen years has been tuned equally? When Wheatstone brought it out he told me it was perfect in 6 keys. Some years ago I had to choose a concertina for a friend by Wheatstone, and to my astonishment I found it was tuned equally. They have the two keys for D♯ and E♭, and G♯ and A♭, but they give the same note. I suppose they found they could not play with the pianoforte. Giulio Regondi, who was the finest concertina player, had two always, one for the orchestra and one for the piano.

Mr. Webb.—I made some experiments once with my piano with regard to tuning, and can bear out Mr. Blaikley's assertions. I tuned two octaves in the key of C perfect, and certainly the perfect fifths and thirds had a delightfully satisfying effect; but, of course, the other keys went to smash. I think one thing we have lost sight of is, that although we have more or less imperfect instruments, and out of tune, on the other side the ear accommodates itself and compensates very much for it. If we have it not, the ear in many cases practically approaches perfect intonation.

Miss Prescott.—The whole theory of modulation and enharmonic change is founded on that principle, that the ear accepts what it wants and not what it gets.

DECEMBER 2, 1889.

W. H. CUMMINGS, ESQ., VICE-PRESIDENT,

IN THE CHAIR.

THE CHARACTER AND INFLUENCE OF THE LATE SIR FREDERICK OUSELEY.

BY SIR JOHN STAINER, M.A., MUS. DOC., PRESIDENT OF THE ASSOCIATION.

THOUGH not one of that class of musicians about whom the public talks with feverish excitement, and though his ways and words were not the object of journalistic curiosity, Frederick Arthur Gore Ouseley was a man of wide influence, and one whose character and labours deserve careful study. He was distinctively a representative man, and in furthering the objects he had in view in life he was uniformly consistent, as indeed every man must be who conscientiously draws up a scheme of work founded on a sense of duty, and turns neither to the right nor left while pursuing it. Whether he chose the best scheme of life or not, we shall by-and-bye try to discover; but the simplicity of his mind, the purity of his motives, the calm persistence with which he aimed at his object, and his immense self-sacrifice in securing it, seem to point more to the chivalrous knight of a bygone age than to the modern worldly artist, who rapidly faces about this way or that way, but who, somehow or other, is always found treading the path which leads to the best market for his wares.

Ouseley was not of this type, he never thought of self except as something to be suppressed in order to realize the cause he had at heart. As you all know, his object in life was to revive English Church music, and re-establish it on the model of a past, and, what he thought, a better style. He certainly seemed to have at his command all that could be needed for the purpose; born in 1825 of an ancient family whose name never is found but in connection with some high sphere, often in the diplomatic service or in the Indian army,

he was the godchild of Frederick, Duke of York and Albany, Arthur, Duke of Wellington, Frances, Marchioness of Salisbury, and his eldest sister, Mary Jane Ouseley. At the time he was born his two sisters were young women, who tended and watched him with motherly care. They soon found that the unexpected heir to the estates and baronetcy was a child of no common order, quick and bright in every way, but gifted in a marked degree with a talent for music. As soon as he knew his notes, which was when only two or three years old, he showed delight in constructing chords on the pianoforte, and he surprised everyone by his power of naming the sounds of whistles and other noises; and he once told his sisters the exact name and pitch of a clap of thunder. On another occasion he quite frightened an unmusical nurse by telling her that a clock had just struck in the key of B flat minor. This sense of absolute pitch never deserted him: when quite a small boy a work by Mendelssohn was produced at a concert in London at which he and J. Cramer were present, Cramer was heard to say that the slow movement was in a particular key, little Ouseley said it was in another, and named it; the child proved to be right, Cramer wrong.

The Rev. J. Hampton, now Warden of St. Michael's, one of Ouseley's oldest friends, sends me this anecdote. In the winter of 1850 Ouseley went abroad for six months; on his return he went to St. Paul's and, as was his custom, went up to the organ loft. Goss asked him to sing C of the organ; Sir Frederick, without hesitation, sang B, which Goss put down. Sir Frederick said immediately, "You have had the organ raised a semitone," which was true. During the six months he had been abroad he had played on more than a hundred organs of different pitches, in Spain, Italy, Switzerland, Germany, and France.

Mr. Hampton received this anecdote from the late Sir John Goss himself.

Within the last few years, whilst chanting the service at St. Michael's College, an accident happened to the mechanism of the organ, and it became necessary to fetch a harmonium during the prayer for the Church militant. On seeing it brought in he remembered that it was a different pitch to the organ, and he gradually modulated his voice towards the end of the prayer with such a nicety that when the organist played the Amen on the harmonium it was perfectly in tune.

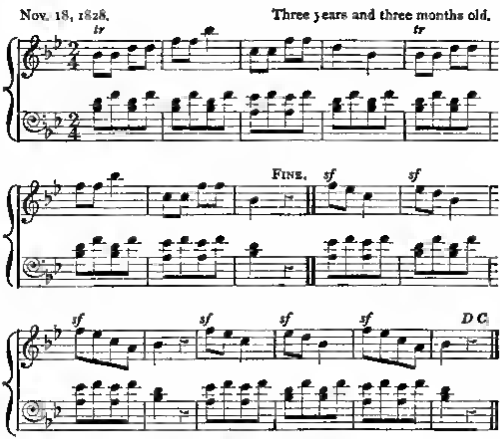
You will find many most interesting facts about his childhood in a short memoir now being published by Messrs. Jakeman and Carver, Hereford, which contains a truly life-like portrait. Canon Havergal very kindly sent me the early sheets to read, but I thought it unfair to make use of them to any great extent.

As soon as his hand had reached a sufficient size he

began to construct little tunes, which he played over to his sister and she wrote down.

Owing to the kindness of Mr. Hampton, his old friend, who succeeded him as Warden of St. Michael's, I am able to show you to-day a little MS. book containing two hundred and forty-three little pieces composed during his childhood; the first when he was three years and three months old, the last when he was eleven years of age. I have gone very carefully through this interesting volume and, from the natural and easy way in which all the chords would fall under a tiny hand, there can be no doubt his sister succeeded in writing down exactly what he played and as he played.

As might be expected, they consist chiefly of short dance tunes, not longer than sixteen or twenty-four bars. I will play you the first, composed, as I said, at the age of three years and three months:—



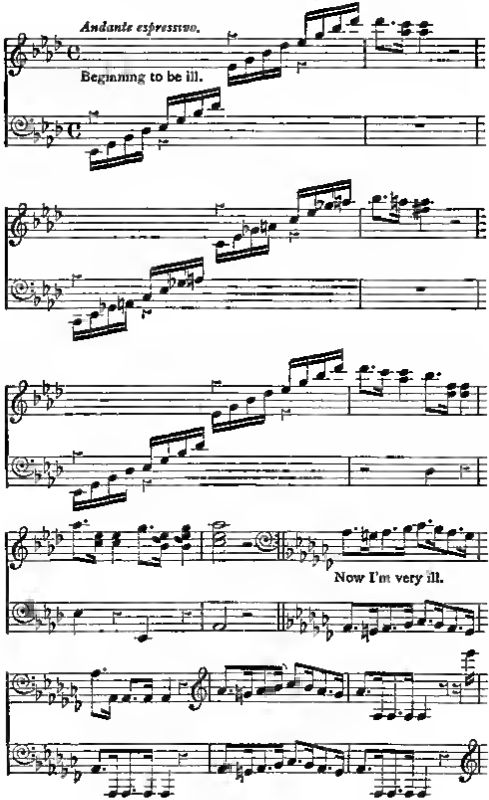
You shall now hear one written when just over five years of age; it is a distinct proof of progress (No. 72).

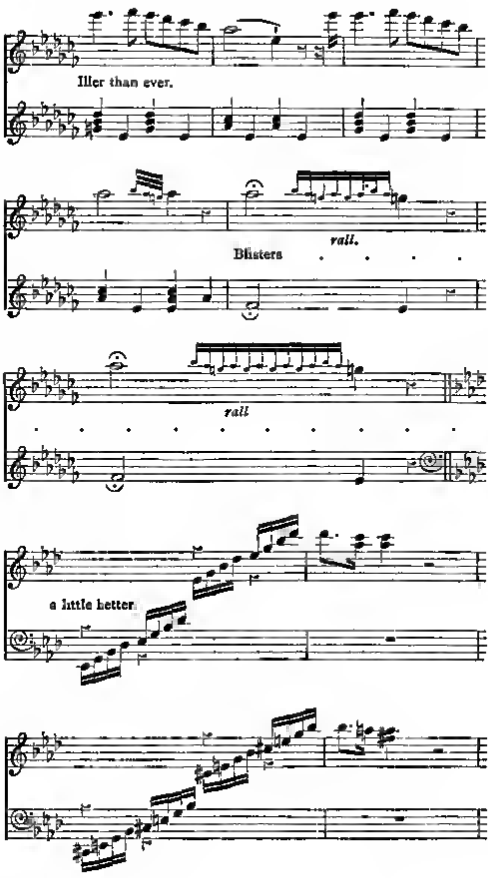
(This was played.)

One written at the age of seven is very interesting as an attempt at a tone-picture. It represents, in a childlike way, "Beginning to be ill," "Now I'm very ill," &c., the state to

be described being written between the lines of music (No. 207). I will now play it—

March 22, 1832 Aged six years and seven months.




Iller than ever.
rall.
Blisters
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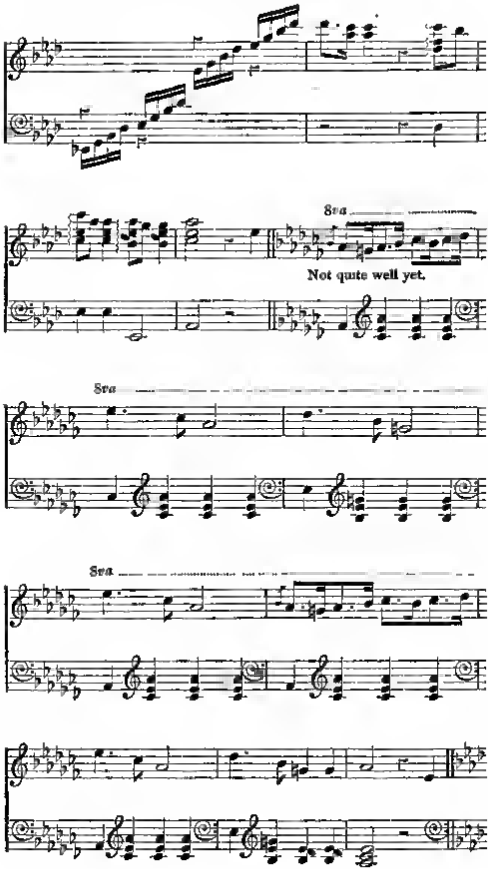
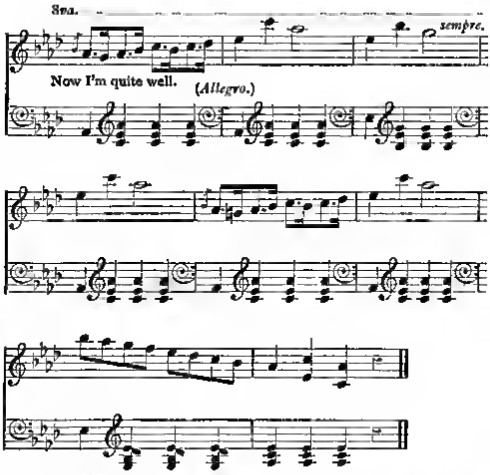

8va
Not quite well yet.
8va
8va



If you will allow me, I will play one more extract from the book, it is called an *Andante con espressione*, and is certainly an excellent piece of writing for a child ten years of age (No. 239)—

(This was played.)

I cannot help thinking that a sound musical training would have been a greater benefit to him than the prescribed classical course of a University. But about this I must speak later on. Of course, Ouseley was a great favourite, and was the centre of a very musical set of undergraduates at Christ Church. Most of you know the splendid staircase leading to the dining hall; it has remarkable acoustic properties, a chord sung clearly will often continue to vibrate for a few seconds, therefore to stand by the central pillar and shout an arpeggio was a favourite pastime of the men; but Ouseley completely beat all competitors at this fun because, owing to his use of falsetto, he could produce an arpeggio nearly three octaves in compass.

I have heard him tell how he and some friends determined to produce a novel effect during a concert at the Town Hall, under the direction of old Dr. Stephen Elvey.

They managed during the day to secrete under the platform a number of metal coal-scuttles, sponging baths, and other novel noise producers, and being safely hidden amongst the timbers, armed with hammers, drumsticks, and other weapons, they patiently awaited the performance of Mendelssohn's "Wedding March." . . . At last it was reached, and in all the *fortissimo* passages these unwonted instruments of percussion thundered away to the infinite astonishment of the Conductor. At its close Ouseley and his friends were anxious to crawl out of their dark and stifling quarters and escape, but much to their disgust the audience, unaware of the cause of the new effects, encored it enthusiastically.

While Ouseley was an undergraduate, Dr. Marshall, the organist of Christ Church, was succeeded by Dr. Corfe, a son of the venerable organist of Salisbury. Being a musician of the old type, Dr. Corfe rarely changed his stops during the Psalms; Ouseley and his young friends got so accustomed to one particular quality of tone that they named it the Corfe-mixture. Ouseley knew that Dr. Corfe always at the close of one service prepared his stops for the giving out of the chant at the next; moreover, Dr. Corfe was fond of long walks, and made a point of rushing into the organ loft just in time to place his hands on the keys. This offered a temptation to the undergraduates which was irresistible. Watching Corfe safely out of the Cathedral one morning, Ouseley put in all the pre-arranged stops, and then drew on each manual the most horrible and startling combination he could think of. When evening service commenced, Ouseley and his friends stood behind a pillar to hear the effect. Sure enough, just as the Psalms approached, Dr. Corfe hurried in and placed his hands on the keys. Everybody in the church gave a start, *except Dr. Corfe himself*, who placidly held down the chord while he one by one put in the objectionable registers, and gradually drawing his usual stops once more reverted to the inevitable "Corfe-mixture." Ouseley's acquaintance with Corfe ripened into a staunch life-long friendship.

Ouseley succeeded to his father's title in 1844, that is, at the age of nineteen. The fresh responsibilities this involved compelled him to give up all idea of reading for honours, so he took his B.A. degree in 1846, receiving what was then known as an Honorary Fourth in mathematics. He then entered Holy Orders, and became one of the curates of St. Barnabas Church, Pimlico. This step influenced and practically determined the whole future course of his life. It was during the short period of his diaconate that he formed the project of devoting himself and his means to the encouragement and nurture of Church music. In 1850 he

became a Bachelor of Music of Oxford. In 1853 he published a collection of Cathedral Services and Anthems. I must pause to say a word about this work. If the motto "de mortuis nil nisi bonum" were to be strictly enforced, I am afraid all history would collapse. So I make no apology for saying plainly that the publication of this volume was premature and ill-advised. It contained but little which has survived, and in the main it gave a very false impression of the powers its author really possessed. It was specially unfortunate that it should have appeared only a short time before he was appointed Oxford Professor; because, when he succeeded Sir Henry Bishop in 1855, there was a considerable amount of dissatisfaction amongst musicians that this "blue ribbon" of the profession should have fallen into the hands of a young amateur.

In those days the post was only an annual appointment on the nomination of the two Proctors, though of course renewable every year, and musical degrees were practically given on the sole responsibility of the Professor. But after Ouseley was appointed, a Statute was passed vesting the election of Professor in an influential and representative body in the University, and constituting public examinations by three examiners as a necessary step to degrees. Twenty years later —namely, in 1876, the system of granting musical degrees was brought still more into accordance with the use and customs of a University by the addition of preliminary examinations in arts. Though these statutes raised the value of the degrees from a general point of view, I am afraid they have had an effect not at all contemplated when they were passed. It is quite unreasonable to expect a professional musician, say forty or fifty years of age, to go in for "Smalls" or to sit at a "Local Examination," hence many experienced and able musicians are now deprived of an honour which used formerly to be within their reach, and worse still, it has encouraged the mushroom growth of all sorts of diplomas and hoods, and the importation on a large scale of degrees from Canada and the United States.

It was soon after Ouseley's appointment as Professor that he came to examine the chorister boys of St. Paul's, of whom I was one. I shall never forget the nervousness with which I approached this musical and clerical dignitary when summoned to meet him in the drawing room of our master, the Rev. J. H. Coward. But I played a Prelude and Fugue by Bach, from the "forty-eight," by memory, and, at its conclusion, Sir Frederick gave me a few words of good advice and much kindly encouragement.

How little could he have dreamt that he was patting his successor on the head!

The next interview I had with him was full of moment to

me; it constituted a turning-point in my life. I was then between sixteen and seventeen years of age, and was playing the afternoon service at St. Paul's, both Goss and Cooper being absent for a few days. During the service Ouseley came quickly into the organ loft and, after greeting me, watched me closely as I accompanied the music from the old "scores." On the same evening I had a letter from him to say that the object of his visit to St. Paul's had been to find an organist for St. Michael's College, and he offered me the post. I must apologise for thus introducing myself into this paper, but it explains why and how I come to know so much about the character and abilities of my patron and friend. In 1857 I found myself, after a railway journey to Worcester and then twenty miles on the top of a coach, settled in the charming building which he had raised at his own cost for the advancement of church music. From it a short cloister led into a church of beautiful design, rich in carved woodwork and stained glass, containing a fine organ, and served by an admirable choir. Here, day by day, choral services of a high standard of excellence were maintained.

In these utilitarian days it would seem to many a great waste of resources that splendid musical services should regularly take place on week-days in a church, with no congregation to participate in them or enjoy them. But Ouseley never viewed it in this light. The services, he said, were for the glory of God, and the offering would be none the less acceptable to Him because it came from an out-of-the-way spot in a remote country district.

The life in St. Michael's seemed, at first, primitive and mediæval. All of us had meals in the large dining-hall, Sir F. Ouseley and his staff occupying seats at a high table, the boys in the body of the hall. After morning service the boys settled down to their school-work, in the afternoon they came to me for lessons on the pianoforte. After evening service and a meal in the hall, I studied or practised, or, as was frequently the case, was invited by Sir Frederick to pass the evening with him. In the splendid musical library he had collected there was a rich store of pure vocal masses of the Italian school in MS. in the old clefs, including not only the soprano and alto, but often also the now obsolete mezzo-soprano and baritone clefs. At that time he had not found opportunities of going carefully through these, and, most fortunately for me, I was asked constantly to play them through to him, he turning over, and from time to time making critical remarks. I gained much from this almost unique chance of studying the vocal writers from, say, 1550 to 1700. Sometimes he would prefer amusing himself in the evening by writing a canon, or some other equally ingenious *morceau*.

I have, I am glad to say, preserved a considerable number of these, and I have brought them here to-day for you to see and examine.

Here is a *Gloria Patri* in canon, 4 in 2 at the under 5th and 8th.

Another is 3 in 1 at the under 7th and 8th, a most troublesome thing to construct.

On the back of one of these slips I find an ingenious little canon sixteen bars in length, in three parts; the second part answering the first by inversion, while the third part is the first part by augmentation.

One page of MS. contains four ingenious canons which evidently gave him as much amusement as trouble to construct: the first is 3 in 1 at the under 5th and 11th; the second, 4 in 1 at the under 6th, 11th, and 16th; the third, 3 in 1 at the under 17th and 19th by inversion; the last is 3 in 1 by double augmentation.

At the bottom of the page he wrote "A page of the driest possible music to console those who suffer from the effects of moist weather."

It is quite true that they are dry, musically, but as specimens of his skill and patience they are most valuable. When he had brought a difficult canon to a successful issue, he used to burst out laughing and clap his hands for joy like a child. He has also written across the top of the canons I have just described: "Heavy artillery discharged on the night of Dec. 20th, being St. Thomas's Eve, in defence of a fortress closely besieged by envy and malice, and garrisoned by ye Oxford Professor." Along the side he wrote: "The notes on this page were made to establish the reputation of our Cathedral dignitaries by one of their own body, who hopes to put cavillers to flight—*i.e.*, qui inimicos *fugare* sperat," which of course might mean "hopes to make his cavillers write fugues."

On another page will be found a canon, 3 in 1 by inversion, over a given *canto fermo;* and over the same bars a canon, 2 in 1, at the under seventh.

Here is a canon 4 in 1, each part following its predecessor at the 5th—*i.e.*, D is answered by G, G by C, C by F, and so on. This process is reversed in the next canon on the same page.

I find a canon, 4 in 1 at the 4th below, "ascending by tones eternally." This extends to thirty nine bars. Amongst all these specimens of the way we passed some of our evenings together, I have here a single chant in eight parts, which he thus describes: "This, if sung alternately Decani and Cantoris, will make a double chant in four parts; either half may form the commencement, so it may be said to contain two double chants. Either half singly will form a single

chant, so it may be said to consist of two single chants. Lastly, the whole may be sung concurrently, when it will make a grand single chant in eight real parts—F. A. G. O."

To me one of the most interesting of these autographs is a clever arrangement of Bach's first Prelude from the "forty-eight" for the guitar, under which he has written "ad usum amici Johannis Stainer aptatum præludium hoc, quo melius quantum organis tantum etiam citharâ præter omnes emicaret D D D. amicus citharœda Michaelensis." He had just made me a present of a guitar, at which I was working assiduously. He was a capital player on the guitar, and also on the obsolete harp lute, and often used to pass the evening singing Italian or Spanish national songs to his own accompaniment, always with admirable skill and good taste. He played the violoncello fairly well, the organ excellently. But his real gifts were shown when he extemporised, quite privately to a friend or two, on the pianoforte. I particularly remember one occasion when he and I were alone in his drawing-room. I was not very well and was lying on the sofa; he offered to extemporise, and sitting down at the pianoforte he played a complete Sonata in four movements, each movement in perfect form, full of invention, rich in melody, and novel harmonic combinations. Fearing to break the thread of his improvisation, I abstained from speaking until he had finished, which he did in the course of twenty-five minutes or half-an-hour.

Yet when this talented man took up his pen to *write* a composition it seemed as if some evil genius stood by to damp his invention and wreck his originality. I have not the least doubt that a proper course of early training in the *technique* of composition would have given him such facility in putting his thoughts on paper as would have made him one of our foremost musicians. I find that all his intimate friends are of the same opinion. He wrote but little secular music, but what he did write was melodious and smooth. I should like you now to hear two songs and a glee which will, I think, interest you. They are not dated, but I believe they were written at various times after he left Oxford, say from 1848-58—Song, "Zephyr, should'st thou chance to rove"; song, "How beautiful is day", glee, "Gem of the crimson-coloured even."—Owing to the kindness of the Rev. T. Littleton Wheeler, I am able to let you hear a "Song without words" (in E minor), one of six written between the years 1839 to 1849.

(These were sung and played)

Although I have not attempted to-day to give a biography of my late friend, you have probably by this time formed your own opinions on the "character and influence" of F. A. G. Ouseley. As a man, his life was irreproachable, his example noble; in the sphere of historical knowledge of his

art probably no contemporary surpassed him, but as a composer, it is impossible not to feel that he ought to have secured a higher position than he did.

This disappointing fact must be ascribed partly to the neglect of that technical training which even a genius cannot dispense with, partly to what I conceive to be the false historical view which he formed of music, especially of church music. For this false view Dr. Crotch must be blamed. Ouseley thoroughly imbibed the spirit of Crotch's "Lectures." In these Crotch traces the history of music as if analogous to the arts of painting and architecture. Other arts, he argues, have reached a culminating point of excellence, and then have gone into decadence; therefore, the art of music is in a similar condition. As a sequel, students are advised to *imitate* the compositions of the so-called "best period" of style. Crotch was an ardent admirer of Sir Joshua Reynolds' "Discourses," and his Oxford lectures are simply larded with quotations from Sir Joshua. If you will take the trouble to read pp. 196 to 202 or 203 of the Discourses (1778 Ed) you will find the gist of Crotch's advice to young composers.

But there is this important distinction between Reynolds and Crotch.

In Sir Joshua's advice to students to imitate the old masters you will always find he guards himself against a reactionary limitation of the scope of art. Not so Crotch in his lectures: he, an infant prodigy just as remarkable as Ouseley, managed to ruin his career as a musician by his blind imitation of the past; and I fear it must be said he too truly succeeded in helping to mar the splendid future which Ouseley's early life distinctly promised.

I know no more sad example of the fallacy of the argument by analogy than this creed of Crotch—that music had seen its best days. If you remember that Crotch began to lecture publicly in 1801, or thereabouts, you will at once see what a very false prophet he has proved to be.

We musicians are not yet called upon to retrace our steps, for our many-sided and wonderful art seems again and again to burst out afresh and find new room for vigorous growth. Of course, imitation of the past in music is a necessary process of pupilage; but, to look upon it as an end in itself, is surely destructive to all progress and expansion. The imitator is, after all, no better than a mere mechanic; the ultimate function of the true artist is not to imitate the old, but to create the new. In order to do so, he must, indeed, tread old paths, but not for the purpose of loitering in them, only in order to trace them up to the very front of the present. There is one insidious temptation which often draws gifted men into the ranks of mere imitators, it is this: the general

ruck of mankind will always prefer an imitation to an attempt at novelty, for the very obvious reason that the public finds it easy to criticise an imitation, whereas only a select and cultured few are capable of gauging the true merits of what is unfamiliar.

Had the lot of Ouseley been cast thirty or forty years later, he might have fallen among better advisers and his career might have been most brilliant. Whether he ever suspected that he could or should have attained a higher level as a composer I dare not say; but the views he expressed about musical criticism and history did not vary to the day of his death. The last time but one that he appeared in Oxford he stayed in my own home, and though he knew that the condition of his health was critical, owing to disease of the heart, I never saw him more cheerful or happy in his simple, childlike way. The information of his death reached me whilst I was in Biarritz, too late to enable me, even by the quickest route, to get back to St. Michael's and be present at his funeral. But I offer to day these few words of respect and esteem for him as a sort of wreath upon his grave. Each of us will indeed be fortunate as, one by one, we sink down and fall out of the living crowd of hurrying, elbowing humanity, if we shall leave behind us such a sweet memory for amiability, learning, and self-devotion as did Frederick Arthur Gore Ouseley.

DISCUSSION.

The Chairman.—Ladies and gentlemen, we have a very pleasant duty to perform, and one particularly agreeable on this occasion, assembled as we are to greet the successor of our late lamented friend. Probably there are many of us in the room who had not only an acquaintance with Sir Frederick Ouseley, but something more than that—personal intimacy and friendship with him; and I am sure to those it has been extremely agreeable to hear the pleasant, kindly, and able words which have fallen from Sir John Stainer on this occasion. Sir Frederick Ouseley we knew well, and those who knew him best knew what a noble, what a great man he was; for his whole life was one continual effort to do good for others, and particularly for our own musical art. If he did not succeed as he intended, and as he wished (and he certainly did not in some respects), it was probably for the reasons which Sir John Stainer has so ably stated. As far as I know, it is the first time that anybody has ever mentioned why Sir Frederick Ouseley and Dr. Crotch—

two very great men, and who had been most extraordinary as children—neither of them achieved anything like the greatness they ought to have achieved considering the early promise they gave. However, I will not detain you any further, but only propose a vote of thanks, which I am sure you will give very heartily and unanimously, to Sir John Stainer, for attending on this occasion, and for having given us this very delightful lecture.

The resolution was passed unanimously.

Sir John Stainer.—I am much obliged to you, gentlemen. It has not been altogether without a little touch of sadness, although with a certain amount of pleasure, that I have come here to speak about my late friend.

January 6, 1890

H. C. BANISTER, Esq.,

In the Chair.

SOME THOUGHTS ABOUT SINGING.

By Frederic Penna.

When it was intimated to me that I might be invited to read a paper at one of the meetings of the Musical Association, I hesitated for a moment, should the invitation come, feeling doubtful whether it was in my power to say anything that would not be as well, or better, said by any one of its members.

But as our art has several branches, I thought on reflection I might briefly treat of two or three phases of that particular branch to which some of the best years of my life have been devoted.

With much pleasure, therefore, I accepted the invitation kindly forwarded to me by your Assistant-Secretary.

The subject of my paper I call "Some Thoughts about Singing," with reference to accent, to certain vowel-sounds and consonants, especially the vowel-consonant—the letter "R"—whether and why English vocal students should go to Italy; and, finally, about the production and the placing of the voice.

The records and the traditions of the vocal doings of some of the English and Italian artists who flourished here during the early portion of the present century go to show that singing, as an art, was much more seriously and sternly cultivated then than it is in the present day. The right production, placing, and cultivation of the voice was regarded as the first and the essential thing, for it was justly held to be the making of the instrument which had to be subsequently used in singing. This production and placing of the voice included then, as it should now, all that pertains to the art of breathing, and to the just employment of the various organs associated in the performance of the functions of the voice.

But I must not anticipate what I propose to myself as the last point upon which I desire to speak in the present paper.

I must ask those of the members of the Association who may be as fully acquainted as I am with the headings of my

subject, to bear with me while I briefly unfold some of my views—not formed hastily or reflected by fancy—which I trust will be found to be in the line of truth (though they are called "thoughts," and are not an exhaustive treatise on any portion of this "beautiful art").

In speaking first upon accent in vocal music, I find there are too many instances in the past and present of song to justify the conclusion that, in the opinion of some writers, accent is but a very secondary consideration. I do not limit this thought to the less pretentious examples of vocal music, I speak of the comparative indifference, as it seems, on the part of some musical writers, as to whether the quality of the poetry they have to set is worthy the search after poetical emphasis. It is true, musicians do not, as a rule, set their melodies to the works of the great poets, and the "rhyming thoughts" of the present day are regarded but as pegs on which to hang melodies. The evil is, that the singer is unconsciously taught to be more or less indifferent to what ought to be a great power; for poetry (the outpouring of the heart of the poet-born), recited or sung, depends for its very life upon a just and full appreciation of the words and their right accent, by him who renders it. But the accent to be well enforced, the sentiment must be nobly wedded to a melody, or melodic inflections, in thorough sympathy with it.

Notes bearing musical accent should never be set to unimportant and unaccented words or syllables, words of a simply connecting character. If circumstances arise making it hard to avoid this, the difficulty may be partially overcome by an expedient. The artistic singer is justified in requiring this. Speaking generally, all notes partaking of the nature of dissonance should be allied to the more important words. In the diatonic scale, for instance, the second, the fourth, the seventh, resolving on the notes of the common chord, should be set, where possible, to the emphatic words or syllables. All words (which good elocutionists would strongly accent) should be set to these or other notes of a dissonant character, such as appear in the various chords of the seventh, ninth, eleventh, and thirteenth. This gives the intellectual singer the chance that is his due. All intelligent singers study their words, and the very letters of which they are composed, and they are never pleased to find articles, prepositions, or conjunctions falling upon notes bearing primary or secondary musical accent.

That composers generally were not very particular in this respect at the time of Handel may be inferred from the fact that Handel himself did not regard it. But it will be rightly said, Handel, though an Englishman in heart and feeling, was not a master of the beauties and niceties of the English language; or perhaps he did not rightly estimate the great

value of verbal accent, otherwise he would not have given such force to the conjunction "than" in that otherwise splendid song, "O ruddier than the cherry." Most of his songs and arias will give evidence of this. I content myself with referring to one recitative, "Thus saith the Lord, the Lord of Hosts," from "The Messiah." The word "of" set in the dominant in an ascending passage of three notes from the third, is a departure from what one feels to be right from a singer's point of view. The late Sir George Smart, who had a very keen ear and mind for accent, and was laden with traditions, invariably made such offending notes very short by dotting the preceding note. This expedient partially removed the offence. But when the purists began to exert their influence, they, by their criticisms, caused vocalists to sing all their notes according to the length and accent given to them by the classical composers, and Handel, of course, was not allowed to be touched. Thus words and their just accents were ignored in the endeavour to present the musical composer with whatever inaccuracies he left behind him. Handel himself, it is on record, allowed his singers, in whom he confided, to make such changes as their good taste dictated, and the great singers who flourished sixty or eighty years ago, such as Mrs. Billington, Mrs. Salmon, the great Braham, and others, made occasional changes and introduced graceful ornamentations, some possibly handed down from the master's time; but in later days no one had the courage to do such things. Why, one might ask? Crivelli, in his great work upon singing, has some valuable arguments in favour of this permission. I have copies of some of Handel's songs marked with slight alterations by Sir George Smart (traditional, I believe), at the time of my being a pupil of his. But now, and for some time past, singers have not deviated from the "black letter" of the text, fearing, I suppose, the reproaches of the purists. The consequence of this is, the intellectual singer has to subject his appreciation of accent to a prejudice that has little to support it but a blind faith in the rectitude of leaving things just as they were found.

In the recitative referred to, "Thus saith the Lord," the word "little" in the phrase, "yet once a little while," as regards its second syllable, is sung to an offending "D" in its connection.

The terminal words of this recitative are important and potent: "Saith the Lord of Hosts"; and with my mind impressed with the laws of accent I submit whether, if Handel had known the English language better, or it had not been too much the custom to be indifferent to verbal accent, he would not have preferred some other musical ending. For the words "Lord of Hosts," Handel gives, as you all know, the leading note, the tonic, and the dominant. With

this close several recitatives in "The Messiah" terminate; some of these may suit the accent of the words to which they are set, but not this instance; the rise to the tonic for the preposition "of" is always jarring. It can hardly be argued that this particular form of close is necessary, or that words of varied import do not require musical phrases suitable to themselves. I urge this from a singer's point of view.

The pupils of the late Sir George Smart, who had the tradition of how Handel's songs and recitatives were sung probably from the time of the great master himself, through Mr. Bates, whom Sir George knew when he was a boy, and who himself was a boy in Handel's time, will be sensible what efforts he always made to equalize and rightly adjust the accents that seemed to war against the sense of fitness. It was for this reason that Sir Michael Costa always advised students to go to Sir George when they desired to be singers of Handel's songs. Sir Michael was one who regarded accent as the life and soul and excellence of singing.

Now the operatic music of Bellini, Donizetti, and Verdi, especially the last-named, has much of its power from the fact that the absolute and relative accents of the sentiments expressed are, generally speaking, in perfect accord with the accents of the melodic inflections. Those who remember Giulia Grisi in "Norma" are not likely to forget her accents, and I think I am right in saying that Costa helped her to the consideration of some of these.

For the singer's sake, and for the vocal art, ought we not to expect the same perfection of united accent in the songs and *arias* of this country? Many indeed are the flagrant instances of false accentuation to be found in the "thousand and three" publications issued to amateurs every month.

Next as to vowels. It has always been held that the beauty of a voice is to be found in the sound of the vowels. The utmost attention then should be given that the vowels be rendered with the rarest purity and the utmost correctness. Every vowel having two, three, or more separate shades of sound, there are necessarily some eighteen or twenty in all that have to be attended to. Now in various provinces in England, some of these vowel-sounds differ from the sounds the same vowels have among the most educated speakers in London, and, I suppose I ought to say, the great seats of learning; and as the perfection of these should be aimed at, I shall be but uttering your own opinions if I say this perfection should be the standard of correctness for the singer. All his vowel-sounds, from whatever province or country he come, should be in accordance with this standard. Now several of these vowels are diphthongal; how, in these cases, should the phases of sound be distributed? The answer is—the singer must make his musical note always on the first

sound of his vowel (even if he have many notes to sing to it), and dispose of his second vowel sound as quickly as possible, and thus make the musical part of his vowel resemble the Italian vowel. This requires a little practice, but his word will be the better understood.

But how is this purity of the first part of the diphthongal vowel to be secured? It is simply by keeping the organs of speech rigid, in one and the same position (the slightest movement alters the sound); the second sound, making up the diphthong, will come, as it were, of itself, by simply allowing the lips to relax themselves, or raising the lower jaw. Example: Pain, brave, bright.

Those who have not had their attention given to this particular will be surprised to find how soon the end is attained by the adoption of the means, and how much more tuneful and musical their notes will be.

This purity of vowel is what ought to be observed, that the singing of the present may be more like the singing of the best days of the art.

It is to be feared tastes are cultivated in too many musical directions, and in the schooling of the day there is such "express" anxiety to go from subject to subject, that the necessary devotion to one can be but rarely seen, and when seen, surprised at, as a thing out of time and out of date.

One word more before going to consonants. Most of the songs and ballads of the day (which usually whirl into a dance before closing) have for their main topic, love. Now it is unfortunate that the word love should have to be so many times repeated, as its vowel sound is difficult (while in the Italian it is easy and beautiful, *amore*), and pupils, I find, are sometimes taught to give the first part of the vowel a sound foreign to itself. If the word *love* began with "s" instead of with "l," as pupils I speak of sing it, it would be *salve*. A heart that loves finds a *salve* for the wound when the love is returned, but I do not think, even then, that the two pronunciations should be united.

Whatever difficulty English vowels possess, that difficulty is overcome by the orator and good elocutionist, and it ought to be mastered by the singer, whose art-work rests no more upon the perfection of his intonation than upon the purity of his vowel-sounds.

In what I have said will be seen the reason of my thinking mistakes are made in vocal exercise books, which seem to insist upon the open vowel "a" (as in father) being made to bear the whole weight and burden of the vocal student's art-work. Until the voice is placed this may be well, but afterwards the "a," as in father, should have no more than its just share with the rest. The "a" in words such as rain is the one giving students the greatest trouble.

Now as to consonants. But little need be said with respect to them in general. Elocutionists divide them into two classes which they call aspirate and vocal, these again they sub divide into explosives and sustained. I pass over the former of these two classes, with the caution that the distinction between the letters of the two classes, which somewhat resemble each other, should be carefully observed to prevent confusion. As to the vocal-sustained consonants, the word "sustained" will suggest that something may be had out of them beyond the mere germs of expression. The letters l, m, n, r, f, v, s, and some of the combinations, will serve the singer well who seeks the aid they can afford him. It is more than tradition, it is history, that the great tenor, Braham, got effects from them quite sensational. His words in recitative, in dignified utterance, in expressions of sorrow, when singing in "The Messiah," in "Jephthah," and in other works, were so delivered that the effect produced upon his enraptured and enthralled listeners was an abiding power, and it was through these consonants.

In singing the sacred name, Lord or God, he seemed to introduce, I am told, an aspirate after the initial letter, which gave an emotional sublimity to the word to which ordinary expression never attained.

This has come down to us from those who knew him well, and who, like the rest of his many admirers, of whom the present Mr. Gladstone, himself a musical amateur of great discernment and taste, was one (and who in those days was not ?), were powerless in his hands and subject to the spell of his superb genius.

My recommendation, then, to the aspirants of vocal fame would be to think well of the vocal-sustained consonants, and get all possible expression out of them, and thus let singing be distinguished from mere warbling.

Before passing to the question next proposed, whether students should go to Italy to learn singing, and if so, why ? I wish to say something concerning the vowel consonant "r." Now this is a letter giving great trouble to many singers for want of a recognition of definite rules when it should make itself heard and when it should be silent. The rules I am about to give were, I have been told, observed by the great actors who flourished sixty or eighty years ago, and they were regarded by Macready, and I think they embrace every possible case. When "r" follows another consonant it should make itself heard, whenever it precedes another consonant it should be silent. This is simple enough. [Break, bring, brass, crush, drive, fret, grieve, prayer, praise, are examples of the one; bars, bird, card, chord, earth, Lord, word, are examples of the other.]

When it ends a word, or when it terminates a word with

the vowel "e," it should be silent [rare, before]. When it ends a syllable, if the next syllable begin with a consonant, it should be silent [ex. purpose]; but if this second begin with a vowel it should be rolled [bearer]. If it terminate a word immediately followed by another word beginning with a vowel [father and mother of this boy], let it be heard; but if there be the slightest pause for effect or grammar's sake let it be silent, it will have done its office. Also, if in a word of two syllables both syllables end in "r" and a vowel begin the next word, the "r" at the end of this first word should not be sounded. [Ex. "To hold the mirror up to Nature"; "an error of mine."]

This not sounding of the "r" at the end of a word leaves the singer able to terminate his note (if the word end a phrase, or be followed by a rest) with the mouth open, which is greatly to his advantage.

I am by this consideration brought face to face with the question—Why do vocal students go to Italy? Is it because the air is softer there, and better for the larynx, the glottis, and the muscles of the throat? If that be the reason, they ought to have been there during the growth of these organs. Or, if this improvement be only while the student remains in Italy, the return to this harder climate would be prejudicial rather than otherwise to him. Indeed, lapsing into his former state would probably occasion mental depression besides. But it cannot be this, otherwise the great Italian artists who came to this country annually years ago for the opera would never have been able to go through their arduous work, which they did to their own satisfaction and the delight of the *habitués*. Trying to account for it in another way, it may be that better artists, as masters, are supposed to reside there. This might have been the fact once. It cannot be so now, for the facilities for coming to this country by railway through the mountain tunnels enable Italian masters to find their way hither in large numbers. And they do come, whether they are masters or simply Italians.

The prejudice existing in this country is too well-known everywhere—that anything Italian is superior to anything English, excepting, perhaps, hot-house fruit and English roast beef. Well then, if not for the air or the masters, is it that the Italian ear is supposed to be more correct than the English ear, and that perfect intonation is catching, and that this true intonation is heard in every street and every corner of the street? No, not for this; for I have heard more out-of-tune singing at night in the streets of *Milano* than in London. But this I will say, that the exuberance venting itself in song was not the result of alcoholic intoxication, but it was the result of cheerful, not ardent spirits.

The one great reason, excepting perhaps for the traditions

of the real Italian operas, is in the language; for with an exception or two all the words end in vowels, and every vowel has but one sound in the same syliable, as the vowel begins so it ends; and while it continues the organs of speech should undergo no alteration of position. They should be rigid. Thus the truthfulness of tone is preserved; assuming the note to be correctly struck, the ear not deficient, and the organs of speech normal, the word is left off with the mouth open.

The consequence of this is that the voice travels and vibrates, and is in effect different from the voice of the Englishman, who has never sung anything but his own language, and naturally closes his mouth. But do all the masters of singing in Italy direct attention to the beauty and the correctness of singing Italian vowels in this manner? Do they not rather let the English students deliver their words as best they can? Or do all the masters of singing in Italy know everything in connection with the right sounding of their own beautiful language? It is the custom for persons in this country to think so. If this be correct it might be inferred by analogy that all English people know how to pronounce our barder but still very fine language. The simple fact that so many elocution masters are employed and known to be necessary is proof to the contrary. And if another fact as proof is needed, the indifferent reading of the service of the Church of England will furnish it.

I conclude then it is mainly for the language they go to Italy. And that they too frequently return to England without knowing how to render the delicacies of the Italian tongue needs no proof. They might just as well have remained here. It may be asked then, are there teachers here capable of imparting, or caring to impart, the niceties of this *bella lingua?* If there are, the supposed great necessity of going to Italy no longer exists. "But," says an English student bent upon working in Italy, "I go there that I may have the language always ringing in my ear." Then he must go to Rome and not to the English quarters; he must not stay at *Milano*, for there the people converse in *Milanese*, so different from pure Italian that an Englishman speaking Italian well would find himself quite unable to take part in a conversation carried on in that *patois*.

Lastly, he may urge as an important reason for going to Italy for study, that there he may learn how best to produce and place the voice for the purpose of singing. Whether this be so or not, and this I doubt, or whether the liquid nature of the language helps to this end without a guide other than nature, I am led by this question to the last point I propose to myself in this paper, which is—how the voice of the singer should be produced and placed.

In this case we must make our appeal to nature, for the rules of art are based upon the laws of nature. Art, in this case, is the offspring of science, whether the relationship be recognized or not. When we find that a direct appeal to nature is insufficient, we do wisely to make an appeal to science and to art. The voice is a gift from heaven. There are good and bad voices, throaty and nasal voices, voices made throaty or nasal through bad instruction. Whether the voice that sounds throaty to the listener sounds so to its possessor, or whether it seems the perfection of vocal tone to him, cannot quite be ascertained. For Edison's phonograph, in its practical application, has proved, I believe, that we do not know the real tone of our own voices as they sound to others. A sufficient reason this for the aid of a good master. Now, singing is somewhat of an effort, however easily some persons may sing. It is not like simple breathing, which is an unconscious action. True and good singing needs sustained breath—here is the effort. The first thing, then, to consider is respiration. The breathing power must be cultivated if singing is to be sustained.

Before speaking of how the breath should be expelled from the lungs, I propose to consider how it should be inhaled, inspiration preceding expiration. Experience has satisfied me, observation has strengthened that satisfaction, and authoritative books I have perused, some more than a hundred years old, written by those whom in these days we should style "specialists," have confirmed the view I express, that the inhaling of breath should be as free as possible through the nose. It is the natural way, we breathe thus sleeping—usually so, and it is an Eastern custom among those who have the charge of children during sleep, to close the lips of those in their charge when seen open in order to this. But singing is not thus natural, and therefore this breathing alone is not adequate. Still the nose should be a great channel for inhaling. What are the advantages of this? They are many. This breathing helps to keep the air-passage through the nose clear, it helps to prevent a tendency to cough which rapid breathing solely through the mouth occasionally gives rise to, and, speaking generally, it is by far the most healthy way (which is the reason of the Eastern custom), it prevents many a cold from being taken.

Inhaling through the mouth only has a tendency to clog up the air passages through the nose, to give tones a nasal quality, and to limit the power and impair the quality of the head voice—the *voce di testa*—even if it do not greatly stifle it. And not exclusively breathing through the nose when coming out of a hot concert-room on a wintry night is not free from the responsibility of having brought to the grave many a delicate person. So that the sooner this breathing

becomes habitual with singers, the better for their singing voice and their health. Some persons, I know, find a difficulty in doing this, but by adopting its practice they would soon overcome its difficulty.

Now the lungs are the great reservoir of vocal power and are capable of holding some 300 cubic inches of air. I give this on the authority of very scientific men, whose studies were concentrated on this subject, such as Sir C. Bell and Mr. J. Bishop. Now, ordinarily, only about 40 cubic inches of air are inhaled and expelled in one act of respiration, while there is an ability to expel 200. We may see from this, how needful it is for singers and actors to cultivate the *filling* of the lungs, and to acquire the power of holding in, or back, the breath, so as to be completely master of the force of the lungs. How should we proceed to get an approximation of this large quantity of air into the lungs? for the possession of lungs of such capacity and availing ourselves of the power are not identical. There are differences of opinion as to whether the lungs of a singer should be fully inflated before the execution of a long or sustained passage. Crivelli, in his work on our art, writes in the negative, but my experience, falling in with authorities I consulted in days past, justifies me in saying that a singer and an actor should habituate themselves to inflate their lungs to the utmost, especially for sustained work. Now to this end there must not be restraint anywhere, from the throat to the lowest part of the chest. The ribs must have full play; and, that they should have the sensation of widening themselves, the shoulders should be kept down. Below the chest the muscles will naturally draw themselves in for a large draught (deportment masters and dancing masters insist upon this). The sensation to the singer should be, that if a pebble were put into his mouth it would uninterruptedly find its way to the bottom of the chest, instead of going down the œsophagus. I think singers and teachers are greatly advantaged when possessed of anatomical knowledge, so far as regards the position of the organs employed in the passage of the breath. Now I find students, in cultivating this breathing power, neglect the control of the end of the expiration. They re-inflate unconsciously and unnecessarily, and, owing to this neglect, in singing a long phrase, the last note or notes come out with a quivering exhaustion. This, of course, is very bad. In order that the phrase or sustained passage should have the whole of the breath, the glottis should be kept closed till the sound is about to begin. To those not habituated to it this is somewhat difficult; but time and patience accomplish marvels. But in the expirations of breath, what is its course? It comes from the great reservoir, through the

trachea (the wind-pipe), then through the larynx to the glottis, the ligaments constituting the vocal chords; it is then guided by the epiglottis (which is in a perpendicular position) to the pharynx at the back (whence the musical tones are formed in accordance with its dimensions); it next comes to the uvula and soft palate.

The sound now proceeds either through the mouth or behind the uvula, through the passages of the head. Now it is just at this point, the division between the two, that the tone of a well-placed voice should seem to be—this is the sensation point, forward as possible—reflected, if I may so speak, by the pharynx* (which extends from the base of the skull to the little bone at the root of the tongue).

This will assure us that the head should not on any account be thrown back. Now, for the *voce di petto*, the open tone, the uvula and *velum palati* should be raised, that the voice should come freely and with resonance through the mouth—not drawn back, else a throaty tone would ensue. This open tone through the mouth is capable of great delicacy and should be so cultivated. It should not be confined to loud and robust tones. Great care, however, is needed to find out its true natural limits, beyond which it should never be forced. These limits once well assured, cultivation should be kept within them, otherwise it would be at the sacrifice of the voice. How necessary then for a master to have real practical knowledge of how to treat a voice, if he have not scientific knowledge!

But for the upper register, the *voce di testa*, or head voice—not falsetto—instead of the sound coming through the mouth it comes through the cavities of the head. When the sound leaves the back of the throat, that is, the bag of the pharynx, it passes over or behind the uvula, and thus through the passages of the head.

I need not trouble you with any scientific statements as to the power of the trachea to elongate itself, or to contract its dimensions, or to the fact that it falls considerably when the *di petto* voice ceases, and rises again for the bright tones—the *voce di testa*. I will simply observe that the seat of sensation of these two productions should be as nearly as possible the same. There should be a note equally attainable from both registers, and it should be in the power of the singer to go from one register to the other and back again while on that note. (In an ascending passage, for example, requiring a note usually taken when alone in the head register, the progression would be improved by that last note being in the same register as the preceding one. This would prevent a sort of anti-climax.) The blending of the two registers here is a point I would urge as an evidence of the right placing of

*The bag at the back

the voice. When they do not blend the production is usually not forward enough. When it is remembered that only the lower jaw moves in opening the mouth, I am at a loss to find out how it is that some persons throw the head back in the endeavour to reach a high note, when the several organs are in front. The result of this action rather impedes the sound from proceding through the channels of the head, besides straining the muscles generally, and almost leading to the conclusion that a person so acting thought the voice passage and the food passage, the larynx and the œsophagus, were one and the same.

The blending of these two registers by some artists is so well done that it is at times difficult to say which is being used, the open or the "bright," as Braham used to call the *voce di testa*.

The fact that this upper register voice comes through the head will suggest that the head should incline rather forward than otherwise, the back part of the tongue slightly rising to direct the sound behind the uvula and soft palate and through the cavities of the head; but for the tone generally, the tongue should lie flat in the bed of the mouth, so that the sound should not be impeded.

Acting in this way with respect to the *voce di petto* and the *voce di testa*, the singer will be free from the two great defects of nasal and throaty tone, and, which is a great desideratum, free from fatigue after a good amount of singing.

If, as is the case, some of the greatest physiologists speak with becoming hesitation on this difficult subject, owing to the complexity of the structure and the many functions the several organs of the voice have to perform, your present reader, who speaks with extended experience and close observation, may content himself with giving opinion and judgment (with respect to the production and the placing of the voice) on the ground of sensation, supported by such scientific knowledge as he could master.

Permit me to repeat—that voice is best placed whose excellence is dependent upon its sensational proximity to the uvula and soft palate. Whether the sounds go through the mouth, or through the posterior nostrils by means of the *ponticello* (the little bridge), the sensation to the singer should be as nearly as possible the same.

With this I conclude. If it seem that I have unduly pressed this last point, I have done so because the question has at times been discussed with so much divergence of opinion, and because I find many unbiassed minds seem to have a difficulty in accepting any explanation offered.

I have said enough to make my views clear, which are not the formations of "yesterday," but the result of years of application, observation, and experience.

In thanking you for your attention, it remains for me but to say I should be pleased to hear any opinions that may seem to traverse mine on any of the topics discussed, in the hope that by such utterance we may get the nearer to that which all artistic natures aim for—truth.

DISCUSSION.

THE CHAIRMAN.—Ladies and gentlemen, we have been listening to a very suggestive paper, and I am sure you will all join with me in according our very best thanks to Mr. Penna for reading it to us. It has been a paper marked by much common sense, the result of observation and long experience, and free, I think you will agree with me, from quackery, which is more than can often be said of papers by those who undertake instruction in singing. I will ask you, first of all, to pass by acclamation a vote of thanks to Mr. Penna for reading this paper.

[The vote was passed unanimously.]

For the rest, it would ill-become me to take up your time by any remarks of my own on this subject, inasmuch as it is, to a large extent, a specialist's subject, and there are those present who are much more capable than I am of offering observations upon the paper. There is only one thing that I can think of as an apposite remark, quoted by Thalberg in his "Art of singing, as applied to the Pianoforte"—that it has been said, I am not sure by whom, that the art of singing is the same on every instrument; that is to say, that every musical performer should direct his attention to the production of a really solid, travelling and pure tone. That is what we, who are pianists, have to direct our attention to. It is an art that is very much falling into disuse now, because, as I think, the principles of touch are very much overlooked, and a very different school of teaching, and therefore a very different kind of tone, is now produced by pianists from that which prevailed in my student days.

Some of the observations that Mr. Penna has made in the early part of his paper seem really addressed rather to composers than to singers, and if there are those present who are engaged in the writing of vocal music, it would be well for them to give heed to all that Mr. Penna has said with regard to accent, and so forth. I will not detain you longer, but ask any of those ladies or gentlemen present, who understand more than I do technically about the art of singing, to discuss the points which Mr. Penna has so ably and suggestively raised.

The Rev. C. R. TAYLOR.—This is a subject to which I have

devoted much attention, and I have listened with considerable interest to all Mr. Penna has said. Perhaps I might be allowed to enforce his remarks about accent. The indifference of composers to this point is a matter which has often troubled me, especially in the services of the Church. The accent or emphasis is frequently given to syllables which would receive no stress from a good reader, while sometimes the converse of this is the case. Most conspicuously is it misplaced in the "Gloria," when we are made to say "Glory be *to* the Father, and *to* the Son, and *to* the Holy Ghost," with false emphasis on the preposition. If choirs were taught to lay stress upon the conjunction "and" it would be in accordance with the best reading, and would bring out more clearly the important truth which the Arian heresy tried to controvert by altering the original words. I am glad, therefore, to have this opportunity of stating how thoroughly I agree in the wish that our composers would be more careful in marking the proper emphasis and accent of their words, especially in the setting of the Church canticles.

Mr. Penna put before us some of the more important points in regard to breathing, but I did not quite understand whether he intended to speak in favour of or against what is called "abdominal breathing", but, at any rate, he spoke very decidedly against having any restraint of tight clothing, and that is important. If persons, whether intending to sing, or to read, or to speak in public, would but get their voices wisely cultivated before appearing, it would be not only a great blessing to themselves, but also to all who attend concerts and lectures, and to thousands of church-goers who are pained beyond measure at the horrible way in which voices are abused and syllables mis-accentuated in churches throughout the land.

Mr. A. D. Coleridge.—Though I have but little to say, I should like to express my gratitude to Mr. Penna for his interesting address. I was glad to hear honourable mention of a musician too soon forgotten, Sir George Smart. The false accents to be found in the music of even such men as Handel and Purcell used to be subjects of irreverent jests to myself and many of us in school-days. One instance occurs to my mind in "The Messiah," "I know that my Redeemer liveth," where the stress invariably laid on the word "my" would seem to indicate a monopoly of salvation. In connection with Sir George Smart another name occurs to me, that of Joah Bates. I took some pains a few years since (Bates was a Fellow of my old college, King's College, Cambridge) to find out from Sir George Smart how it came about that a young B.A., though a good scholar and a distinguished man, should have been specially selected to conduct the first Handel Festival in Westminster Abbey. I

waited on Sir George Smart, hoping to get the information from that gentleman. I remember his saying—"I am not going to humbug you; Joah Bates was a grandee, and I, a young chorister boy aged ten years, never dared to speak to him; I merely stood by his side and turned over the leaves at the organ; I never questioned him as to his recollections of Handel, I was too young for that." I fancy that Handel was a better Italian scholar than English, some of his Italian letters are far better expressed than what I have seen in the English collection. Some three months ago I called at Hastings on Mr. Charles Lockey, a favourite singer of mine in boyhood, and he told me that Sir George Smart was the best authority for Handelian traditions Lockey studied under Sir George for seven years, and owed to him much of his success as an interpreter of sacred music. After some experience of Italian masters in Milan, Florence, Rome, and elsewhere, I must endorse some of Mr. Penna's observations respecting them. With some exceptions, I think their merits, as a class, are exaggerated. They are too often very inferior musicians. The difficulties with English vocalists are in the management of the vowels, and notably with "e" and "u." Here the Italian has naturally the advantage of us, and can teach us a good deal. I heard at the Birmingham Festival a certain famous soprano shirk the word "beak," and substitute for it the exclamation "Ah!" Vowels are a great difficulty, but I have known English masters as competent to deal with such vocal difficulties as the Italians.

Mr. Herbert.—I imagine few have suffered more than I have from the bad marriage of music to words. I have had a good deal to do with congregational singing, English hymns, and so on, and the tunes that have been put to some Catholic hymns have been something so dreadful that I scarcely have words to express it. As to what Mr Penna said about accent on discords, I also have felt that constantly in plain chant, always taking care that an accented note should be on a discord. I remember Braham very well, and can confirm everything Mr. Penna said about his wonderful singing in every respect. There is another thing about accent I should like to mention, and that is the definition of musical accent. I have often been asked to define it, and I did once try to do so. It occurred in this way. There was an organ recital at Bonn in Germany, where I was living, by one of the first organists on the Rhine, and the organ builder, in whose shop the performance took place, asked me afterwards what I thought of it. I said I did not think very much of it, it was correct, but there was no accent. Well, the organ builder said, it is not possible to play with accent on the organ. I said "indeed?" He said he did not think it was, and he turned to two professional men, a pianist and a violoncello

player, and he said, "Nicht wahr, meine Herren?" The cello player held his tongue like a wise man, but the pianist also thought it was not possible. So I said, "Well, supposing our definitions of accent differ, I should like to hear you define it." He hesitated a little, and he said "I suppose I should define accent in a phrase or series of notes as playing one note stronger than the others." "Oh," I said, "that is quite enough; if that is your definition of accent I quite understand." Of course on the organ you cannot make one note stronger than another. There were no swells in Germany then. That led me to consider whether one could play with accent on the organ. I should say that I fulfilled the duties of organist at that time for seven or eight years, and at last I came to the conclusion that musical accent consisted in *taking a very small quantity from one note and giving it to another.* That definition has been given to several professional organ players here in London, and has met with very great approbation, and they said it never occurred to them, but they felt sure that was the right way of putting it. I do not know whether you will approve of this, but I give it to you for what it is worth. Then with regard to the projection of the voice. I was taught by a man whom some of you may remember, whose name was Herr Kroff. He was a Bohemian by birth, and he came over here and was the first who sang Schubert. On all the first edition of Schubert's songs—Wessel's edition—you will see "Sung by Herr Kroff." He had a certain theory which, I believe, died with him. I do not know how it is now-a-days, but I asked Mr. Thorndike, and he agreed with it to a certain extent. The theory was this, that as the voice rises in pitch the larynx descends. There was apparently something in it, but whether it was really founded on absolute truth I have no means of ascertaining. He had no professional pupils, but his own singing was something superb. I have heard him sing "Adelaida" as I have heard no one else ever sing it; and Handel he also sang very well. He agreed most certainly with Mr. Penna as to the pressure in the lungs preceding the emission of the voice, and since that time I have thought a great deal about it. It is the same as in the bow of the violin; the pressure of the bow must be on the string before the bow is started. The same thing with the organ, the wind must be in the bellows before the key is touched. If it is not, you will have a certain sound which we all know perfectly well. I think I might supplement Mr. Penna's admirable paper with a few remarks on speaking in public. We all know how few amongst us Englishmen know how to speak. First of all we do not know how to use our voice, and next, we never know exactly what we are going to say, and we hum and haw, and put in that extraordinary

"er," which every one is so fond of. Then, every one speaks on too high a note. Latrobe, who wrote on Cathedral Music, tells those who intone the prayers to do it as low as they can, "to the end that the people may the better hear," and I believe that in every case if speakers were to pitch their voices lower they would do well. I once heard the best preacher in the town where I lived, Bonn, preach a sermon, the first words of which were (in German, of course), "We want men." Those words he uttered at a shout—an absolute shout—as loud as he could and as high as he could. If, instead of that, he had begun quietly and then gradually raised his voice as the occasion required, a much better effect would have been produced. Another point is, that none of us, or very few of us, know how much of our voice is available for speaking. Of course you all know that everyone has, more or less, an octave and a half in his voice, and I maintain that the whole of that is to be used, and can be used, in speaking, if you know how. If any one would take the trouble to take a single speech, either the soliloquy in "Hamlet," or the soliloquy in "Cato," in Addison's play of that name, and begin on the lowest note on which he can speak distinctly, and then gradually raise the voice until he came to the highest note (of course that will not be what is right, that is scarcely credible), it would show how much of the human voice can be used in speaking. I believe the great majority of speakers confine themselves to three or four notes, and I certainly believe that they can use, and ought to use, a good many more.

Mr. Southgate.—I should like to join in the tribute of satisfaction that has been paid to Mr. Penna for his paper; but there is just one part of the first portion which calls for a word of warning. It is what I may almost venture to term his denunciation of accent, not right accent, but accent in an unusual place. It must be remembered that (independently of the words) music itself has its accents—its rhythmic accents. It is not always possible that the musical accents and the accents of the words should coincide. No doubt it would be a very happy thing if they did. We know that in the early times this was a matter on which there was complete indifference; if I remember rightly, it is recorded that Lawes, in the reign of Charles I., first taught us how to place the accents of words and poetry together to produce a good musical effect. Of course, Mr. Penna's remarks would apply specially to what we may call solo singing; he would not so argue with regard to quartet singing or part-writing; in the case of fugues, &c., we have really no words, or words of very little signification. Fugues and canons are principally a set of exercises, if I may say so, on musical notes; therefore, I pass over that, it is just a question of the words of a song. Now in setting a poem,

a composer may have to adapt it to a certain time; he feels that to get it into a rhythmical period, the time accents will not always coincide with the words; he is therefore driven occasionally to put very important words, not at the primary, or first accent of the bar, but in some other place. The words must be there, and the music must fit them as well as it can. I quite agree with what has been said by Mr. Penna and others, that composers very often show a very large amount of indifference as to where they do place those words, and they might well place them better. In the case of Handel, it should be recollected that he was a foreigner, that he never thoroughly mastered our language, although he was here very many years, and there are in his oratorios many grotesque examples of his having misplaced words. One might cite a dozen, but there is one example in that chorus in Solomon, "May no rash intruder." It always struck me on hearing that, how false is the accent. It is a beautiful chorus, the harmony on a pedal point at the end of it is one of the most delightful things Handel has written; but that "May no rash intru*der*," with a strong accent on the last syllable, jars on the ears very much indeed. Mr. Coleridge mentioned a good specimen from "The Messiah," and there is an example of the same character in "Israel in Egypt," "Thou shalt lead them forth." It is impossible for the singer to sing the music with the words Handel has attached to it. Neither can the breath be taken nor can the phrase be properly finished, and so it has to be altered. Of course, Handel was a foreigner, and did not know better; but we have amongst us many composers who ought to know better, and fail to make the accents coincide. There is another view of the subject which I venture to think presents much greater difficulty in making the accents go right. What are you going to do in the case of the large collections of songs translated from foreign languages? Beethoven, Schubert, Mendelssohn, and others have written songs in German, and in other languages which people will have sung in English, and they must be put to the best English words you can get. What a terrible difficulty the unfortunate translator and adaptor has to cope with. There are accents which may fit the words to which the song was originally written very well, but they can no longer fit them in the adapted version, and therefore they cannot coincide. Though we may agree with Mr. Penna, we must exercise a little caution in condemning misplaced accents. If you place rhythmic restrictions on translators and adaptors you may fail in obtaining an exact rendering of the music, which foreign composers have set to other than English words. With regard to going to Italy to study and hear music, I can endorse all that has been said. I have been to Italy and, I

must say, more dreadful music I have never heard, either in churches, theatres, concert rooms, or streets. The charming Italian music is all a myth, according to my experience. But is there not one reason for professional singers going to Italy which seems a more likely explanation—the fame of the great Italian schools of singing? I think there is a sort of feeling existing among our thoughtful students that if we go to a singing-master in London we shall first run through our exercises, and then we shall get on quickly to songs. If you go to Italy, it is for a long course of grinding at the scales and solfeggios, and for very few songs—so I am informed. That affords something like an explanation why people go there. The most important part of Mr. Penna's paper, I think, was that in which he rightly and properly complained of the mispronunciation of the English language. I am afraid that does not apply to singers only, as Mr. Taylor told us, it is also applicable to speakers, and we all recognise that. Most people are not taught to speak properly, possibly the fault is not quite their own; one consequence is that when people begin to sing, instead of taking special pains to master the words of their songs, they treat them just as if they were words they were going to speak, and get through the song in the best way they can. That is one common fault we are all painfully aware of. In a song of Mr. Gerard Cobb's, I recently opened, I saw a good little note he had put at the commencement, which struck me as being quite advisable for singers to turn their attention to. He says it is necessary, in order to sing a song properly, and to get the proper amount of expression from it, to master the words first. He prints the words at the beginning of the song, and begs singers to sing them through and appreciate their significance before attempting to render them. I think that is a very good idea. There is one special singer before the public now who is a great favourite; it would not be right to mention the name, but so badly does she pronounce the words that I have frequently heard her sing, and for a long while have not been able to determine the language she was singing in. I say that, having some little knowledge of foreign languages myself; but it was impossible to tell what language was attempted. That is a very great blot, and one we ought all to set ourselves to remove; because, if music is to heighten the effect of words, and to give forth emotions beyond the mere utterance of words, then pray let us get the words clearly so as to obtain the dual effect of the music and the words together. As to the latter part of Mr. Penna's paper, I think possibly only experts should speak; but I must say, from my limited knowledge of what was stated, I should quite agree with him; and in the statement he made about the tongue lying flat in the mouth, it is very necessary to

allow the breath a free passage of sound over it; but there are sounds in the English language which require the tongue to be brought forward. In almost all cases where the letter "t" occurs it is absolutely necessary for the end of the tongue to touch the teeth, and there at once you get a restriction of the sound. Possibly, in reply, he may say a word on that point.

Mr. PENNA.—Generally speaking, I am happy to find that my views have been confirmed by all who have done me the honour to make remarks on the various points referred to in my paper. I am much obliged to Mr. Taylor for assenting to everything I said, and I beg to confirm what he said with respect to improper accents in church music. When I was bass singer at St. Andrew's, Wells Street, I used to be very much concerned at times with the bad accents on words, because, prior to that time, I had been a student of elocution, and knew quite well where the accents should be in speaking, and therefore I was very much irritated in finding so many accents which jarred against my sense of what was right. With respect to the diaphragm breathing, I do not know whether I ought to say that I quite coincide with that; I do not wish to say that it is wrong, but, at the same time, my idea is that you should get as much breath in the lungs as you possibly can to the very lowest part, and I have always thought, and found it to be true, that the abdominal muscles drew themselves in when you inflate the lungs. You should have the sensation of widening your chest, I do not mean to protrude it at all, but just to widen it to get it inflated. I do not quite understand diaphragm breathing; if it is meant that there should be a depression of the muscles here, I do not think it gets a larger amount of breath into the lungs. But I think if you take breath in without thinking that you are doing it, the lower muscles are drawn in, and the more you inflate with that view I think the more successful you will find you are. I am pleased also to find so much assent to what I have said by Mr. Coleridge and others. With respect to Sir George Smart, he had the tradition of the Handelian songs to a remarkable degree. I was not so long under Sir George as Mr. Lockey was, but I received a great deal of instruction from him when I was in a position to appreciate it to its full. I need not say anything of what he said to me any more than that he expressed gratification with the attention which I assuredly paid to what he said. He gave me reason to believe that many of the alterations he had made in Handel's songs were traditions handed down by the great master or accepted by him. There are ample reasons for thinking that Handel himself allowed Mr. Beard, who was his great tenor, and other singers whom he confided in, to make just what alterations they pleased, not only with respect to accent, but with

respect to ornamentation; but, as I said in my paper, nobody in the present day seems to have courage to do such a thing. Whether the mind or intellect is wanting I do not know, but I do not see why there should not be made graceful notes. Crivelli has some very valuable arguments in its favour in his work on singing, and introduces an example from Gluck, and those who read his book will be quite of opinion, I think, that the change of notes for accent's sake in the Italian makes an improvement. This remark I ought to make, too, in connection with what has been said with respect to translations. Mozart's "Clemenza di Tito" was, I think, composed in German,* and when it is in Italian some of the notes are altered, and in one case, I think, a minim is changed into four quavers, or something like that, in order to get the best sense of the words out. The remarks which Mr. Herbert has made I coincide in, and I think his definition of accent is something quite unique and worth consideration. It is rather like what is called *tempo rubato*, is it not, taking from one note and adding to another a minimum of it? [At this Mr. Herbert shook his head.] But a good effect is produced at times by *tempo rubato*, and one can understand perfectly well that accent may be estimated according to that definition. My remarks certainly appertained to solo singing. Of course, Mr. Southgate is perfectly right that in quartets it would be impossible that every word and note should have the right accent, otherwise the quartet would be all up and down, anyhow; you must recognise *musical* accent entirely in concerted pieces. Translation is a great stumbling-block. I have said for years that if an Englishman is to sing Schubert's songs, or any of the German *lieder*, he must sing them in the original language. It is very difficult to give the full sense of the phrases in the new tongue. I do not know that anyone is perfectly justified in making the necessary alterations in a German composition while the writer is living, in case he might find fault with it; but it has often been a stumbling-block to thoughtful singers to render translations of songs, and it is very rarely that any good comes of it. About the words in speaking, elocutionists are needed in this country, not only as regards vowels, but also as regards consonants; and I thoroughly confirm what has been said as to keeping the voice down; if you speak in a high key the voice vibrates too much, and you never quite hear what the word is. If people will speak deliberately, sound the vowels and consonants rightly in a low key, the voice will travel. With respect to the tongue, for the voice to come well out of the mouth in the open tone you must keep the tongue down and the tip of it should be against the lower teeth. I quite agree

*I have been informed that though the opera was first produced at Prague it was rendered in *Italian*

in that, but, of course, for certain words you must raise it; but I was speaking in a general way with respect to tone. To get a volume of tone out of the mouth you must have the tongue in the bed of the mouth and its tip against the lower teeth. When you elevate the uvula and soft palate at the same time you have a fine opening for the sound. I do not think there is anything else I need say. I rather thought there would be more divergence of opinion, and it is a source of happiness to me to find that the labour of all these years has not been in vain, but that it is confirmed by gentlemen with very large experience, whose remarks have afforded me exceeding pleasure to listen to. I am much obliged to you, sir, for presiding on this occasion, and I thank you all for the kind attention you have given to the paper.

Mr. SOUTHGATE.—I might be allowed to add that some foreign composers have been very particular with regard to the words. It was lately my duty to examine the original score of the "Elijah" of Mendelssohn, and Mrs. Bartholomew kindly placed it at my disposal. It was Mendelssohn's habit to send the score in pieces to Mr. Bartholomew to put the English words to it, so exact a man was he that frequently he was not satisfied with the words Mr. Bartholomew had written, and, knowing our tongue very well indeed, understanding and appreciating our accents, he frequently altered and selected much better words than Mr. Bartholomew had adopted. It is easy in the original score to see this, because Mendelssohn has written his words in lead pencil, whereas those of Bartholomew are all in red ink, and I must say in many cases Mendelssohn's English was the better of the two.

A vote of thanks to the chairman concluded the proceedings.

February 3, 1890

Professor W. GRYLLS ADAMS, Vice-President,

In the Chair.

RICHARD WAGNER.

By the Rev. Henry Cart.

Ladies and Gentlemen,—I feel that by way of preface I must ask your pardon for venturing to intrude upon your notice a paper very hastily composed, scrappily written, and to a great extent carelessly put together. I must tell you that when the idea of this paper first suggested itself to me I hoped that I should be able to devote much time and study to the consideration of so vast and absorbing a subject, but since then circumstances have materially altered, and I have been obliged to give my whole time to other matters more especially connected with my work as a clergyman which previously had not been thrown in my way. But is not this the way with so many matters in this hurrying, driving, bustling, brain-wearing age in which we live; we propose to ourselves great things, but how many attain to them? I at least so far as this paper is concerned must in dust and ashes sit with covered head and say "Peccavi, I have sinned." And then again, why should I speak to you about Richard Wagner? I never knew the man, I only saw him once; I have never been to that musical Mecca, Bayreuth; I have never seen any of his operas performed in his native land; and I have not exhaustively studied his life, works, or character. Well, I suppose there are two reasons to account for this whimsical caprice in my selection of a subject: first, a blind following of the spirit of the age, a spirit which prompts people to talk a great deal about what they know very little of, and secondly, an earnest desire on my part to ascertain the attitude of members of this Association towards so great a genius as Wagner, and to elicit a genuine expression of opinion as to the future prospects of what has been not inaptly, though I will not say prophetically termed "The music of the future." If this paper only arouses and awakens an interesting discussion amongst the members here present, my object will have been more than fulfilled, and we

shall all leave this room with the very candid opinion that the second half-hour has been far more entertaining and useful than the first one. Such sentences may suggest to wily-minded individuals that I am what is called "fishing for compliments," but I assure you I am not, I am convinced within myself that I am speaking solid and indisputable truth.

But enough, or rather too much, of preface, if I run myself down any more I shall have you all leaving before I have begun, and therefore let us to work. Richard Wagner was born in "La Maison du Lion Rouge et Blanc," at Leipsic, on May 22nd, 1813. He was the ninth and last child, and soon after his birth, his father, who held a small appointment as "greffier de police," died. It is noteworthy that Wagner's father had a great taste for things dramatic, and was also fond of poetry; on one occasion this worthy acted in a somewhat rough and ready representation of one of Goethe's plays. We must also bear in mind that Rosalie Wagner, a member of the three triads which formed the family, was accounted a good tragedian. Dramatic instinct and appreciation were therefore existing elements in the family from the outset. These elements were further accentuated in the fact of Albert, the eldest brother, becoming an actor and singer at Wurzburg and Dresden, and afterwards "regisseur" at Berlin. This brother had two daughters who were singers, and and one of them was compared to no less a person than the famous actress—Wagner's star and ideal divinity—Madame Schroeder-Devrient.

Wagner seems to have had a most inspired birth, for, according to his own account, the Norn—*i.e.*, one of the Fates in the Scandinavian mythology—deposited on his cradle "the never-contented spirit that ever seeks the new," a gift which seems to me of somewhat more than doubtful value. But as yet the apostle of Bayreuth lay in his cradle and peacefully slumbered.

The mother did not long endure the estate of widowhood, but in hot haste married one Geyer, now a painter, but formerly an actor. This imported into the family a fresh amount of enthusiasm for the drama and everything relative to it, and had an immense influence on the very impressionable mind of the young Richard. It seemed the decree of the nursery-cradle Norn that Wagner from the first should be bereft of paternal guidance, for Herr Geyer died just before the boy had completed his seventh year. At the age of nine Wagner was very fond of playing to his friends his small *répertoire*, consisting of the Overtures to "La Flute Enchantée" and "Der Freischütz." These were from necessity performed on the pianoforte, an instrument with which Richard in after years was never in love. The young enthusiast had a wondrous admiration for Weber and for his works, and you

see in this that Wagner was unconsciously selecting a model for his own school of music, though little but blind devotion to a great master was evident at this early age. Writing in 1860 Wagner frankly says, "I received from this master my first musical impressions; his melodies filled me with enthusiasm, his character and his nature exercised on me a real fascination, his death in a far-off country filled my childish heart with desolation."

Wagner's first school was the Kreuz-Schule at Dresden, and whilst here he developed a great passion for the study of Greek, as also of poetry and mythology, and a great predilection for the works of our immortal Shakespeare, or Lord Bacon, or whoever else we may have to thank for our marvellous dramatic inheritance. As instances of his application to these subjects it may be mentioned that in his leisure time he translated, merely for amusement, some part of Homer's "Odyssey"; also that he took the prize at a "concours poetique," and undertook by himself a metrical translation of one of Romeo's monologues. (A remark *en passant:* does not all this remind you very much of certain similar characteristics in the early stage of the career of that illustrious musician, Hector Berlioz?)

It was at this time that the boy took in hand the stupendous and immense task of writing a tragedy, which was conceived on such liberal lines that no less than forty-two persons died in the course of the piece, and most of them were obliged to be resuscitated and to appear as ghosts in order to supply a *dramatis personæ* for the last act.

In 1827 Madame Wagner returned to Leipsic, her daughter, Rosalie, having secured an engagement at the Stadt-Theater in that city. This necessitated the placing of young Wagner at another school, and it was now the College Nicolai that claimed him as a pupil. Wagner's natural pride at this juncture suffered a great rebuff, for, as regards his studies, he was now placed in a lower grade than that which he had occupied in the classes at the Dresden school, and so the young gentleman sulked a little, and thought a great deal more of and about music than he had hitherto done; in fact, lessons were soon neglected for the study of what was to become one of the absorbing passions of his life. This musical longing received a great impetus from the hearing of some excellent performances of Beethoven's Symphonies at the far-famed Gewandhaus concerts. The death of Beethoven which occurred at this time served much in intensifying the impression produced on the child by these mighty works of musical genius.

After hearing Beethoven's "Egmont" Wagner thought he would study harmony, and having purchased Logier's "Traité d'Harmonie" at a secondhand bookstall, and pored

over it for eight days, he set to work to compose music for the grand tragedy of which I have already spoken. The music of the young Wagner was to be, in his own idea, somewhat similar to that written by Beethoven, for were they not, even though the hand of death had removed one of them, illustrious composers!

Wagner's next work was the composition of an overture, and this was taken with wondrous assurance to Dorn, the *chef d'orchestre* of the royal theatre, Wagner having obtained an introduction through his sister, Rosalie. Dorn accepted it, put it in rehearsal, and had it performed between the two acts of a piece then being played at the theatre. In the scoring of this composition the drum was very prominent, and indeed so preponderated that the overture was at once nick-named "Ouverture aux tumbales." Wagner thus remarks on this early effort: "This overture was indeed the culminating point of my folly. To facilitate the proper interpretation of the piece I had had the notion to write it in ink of three different colours: the music for the strings was written in red ink, that for the brass in green, and that for the wood-wind in black. The general treatment of the work was so elaborate that Beethoven's Ninth Symphony would have seemed, in comparison with it, as nothing more than a Sonata by Pleyel."

In 1830 Wagner entered the University of Leipsic as a student in philosophy and æsthetics. It was here that he met Theodore Weinlig, cantor of the Church of St. Thomas, and this good man made it his task to lay a thoroughly excellent foundation for any subsequent musical studies which his pupil, Richard, might engage in, and thereby did more real good for the youth than can at first sight be appreciated.

Wagner was soon at composition again, and now produced a polonaise, a sonata for the pianoforte, an overture with fugue, another overture, and a symphony in four parts or divisions.

In the summer of 1832 Wagner visited Vienna and Prague, and it was at this latter city that his symphony was first performed. Whilst at Prague he composed a dramatic poem entitled "La Noce," and on his return to Leipsic began to set it to music, but on his sister Rosalie objecting to the poem, he tore it up, and thus brought his work to a hasty conclusion. (Another passing question now suggests itself: Why is it that all musicians, especially those whom we call *great* musicians, are so uncontrollably violent as regards their temper? Are they out of tune with the universe, or only jarred by discordant humanity?)

Heinrich Dorn, writing in 1832 about Wagner's extraordinary devotion to and admiration for all that concerned Beethoven and his works, says: "I am doubtful whether there ever was a young musician more familiar with the

works of Beethoven than Wagner at eighteen. He possessed most of the master's overtures and large instrumental pieces in copies made by himself. He went to bed with the sonatas, and rose again with the quartets. He sang the songs and whistled the concerti, for with pianoforte playing he did not get on very well, in brief, there was in him a regular *furor Teutonicus*, which, combined with considerable scientific culture and an extraordinary activity of mind, promised powerful shoots."

During the course of the year 1833 Wagner's symphony and one of his overtures found a hearing at the Gewandhaus concerts in Leipsic.

The young composer was at this time much written up and belauded by his friend Henri Laube, who in the *Journal du Monde Elegant* gave him the most flattering criticisms.

Wagner now spent a year with his brother Albert at Würzburg, he having the post of *chef des chœurs* at a salary of ten florins per month. During this time he was engaged on the composition of his first grand opera, "Die Feen," the subject being taken from a fable by Gozzi entitled "la Femme Serpent." The music of this work reflects in great measure the triple influence of Beethoven, Weber, Marschner. It may seem strange to include the name of Marschner, but Wagner was at this time much impressed by a study of this composer's opera of "Hans Heiling," and it was during his stay at Wurzburg that Wagner composed a finale to an aria in Marschner's "Vampire," writing both verses and music, of which latter there were 142 bars.

In the spring of 1834 Madame Schræder-Devrient sang in opera at Dresden, and much was Wagner charmed and delighted with her singing and acting. From that time she became his ideal in so far as she represented to his mind a most perfect combination of the musical and dramatic arts.

It was about this time that Wagner, deserting the true principles of his art, began to think of what would please the masses and therefore result in pecuniary gain to his own pocket, and he noticed that applause was most frequently given to the music of Bellini and to the dramatic action contained in such operas as Auber's "Masaniello." What a happy thought, what a blest result, could he only in some way combine the two! The attempt was made in Wagner's second opera, written during a vacation at Toeplitz in Bohemia. The subject was taken from Shakespeare's "Measure for Measure," and the work was known in the French as "Defense d'aimer." If one pauses here for a moment to contrast these two early operas from Wagner's pen, "Die Feen" and "Defense d'aimer," you will see that they present in miniature the two opposite extremes of thought which may be discovered as running throughout

Wagner's subsequent and later works; two streams of thought, sometimes associated, but most often disassociated, the one tending towards all that is good, noble, pure, self-sacrificing, and heroic; the other boiling, bubbling up, and surging over with all that is fierce, passionate, hateful, sensuous, carnal, and immoral. You may see these characteristics, combined with a rare genius and extraordinary amount of inventive skill, in Wagner's "Tannhäuser," where *Venus* and *St. Elizabeth* strive alternately for the victory.

In 1834 Wagner accepted the position of musical director at the theatre of Magdeburg. During the first year he was in office there the overture to "Die Feen" was performed, as also another overture he had written for a drama called "Christopher Columbus," a composition for New Year's Day, the theme of which was based on the *Andante* of his symphony, and some songs he had written for a whimsical farce called "The Spirit of the Mountain."

Wagner's second opera was performed at Magdeburg in the spring of 1836. There were two representations, the first one being for the benefit of the director of the theatre, whose affairs were in a state verging on bankruptcy, while the second was for the benefit of the luckless composer. A fairly good audience assembled for the first performance, but as the singers were in a state of thorough disorganisation, a hopeless state of confusion prevailed throughout the evening. At the second performance matters came to a crisis. The audience consisted of the director and his wife, and a Polish Jew arrayed in holiday costume. Before the rising of the curtain a free fight was engaged in by all the artists, so that the "regisseur" was obliged to come forward and announce to the overflowing (?) audience that the performance could not take place at all. The music of the opera was much praised in a Magdeburg newspaper. It should be mentioned that, before the first performance took place, the dramatic censor, who had not seen the body of the work, yet objected to the title, and insisted on its alteration, though, as regards the work itself, he solemnly accepted Wagner's artfully-conveyed assurance that it was founded on a *very serious* play by William Shakespeare. The new title given to the opera was "La Novice de Palerme."

Wagner now tried to get the opera produced at Leipsic, but the very free tone of the libretto was objected to; he therefore took it to the manager of the Residenz Theatre of Berlin, and it was here that he saw Spontini conducting his opera of "Fernando Cortez," a sight which much impressed him, he being especially filled with admiration at the rhythm and precision of the whole, and the intimate connection between the music and the action.

It may be interesting here to note that Wagner uses an air from "La Novice de Palerme" in "Tannhäuser," in the introduction to the third act.

Wagner, after a short stay with Dorn at Riga, rushed off to Königsberg, whither he was attracted by the presence of Wilhelmina Planer, his *fiancée*, she having secured a part as *première amoureuse* at one of the theatres there, and, having gained the post of leader of the orchestra at the same house, he forthwith entered into the holy estate of matrimony. His marriage day was November 24th, 1836. Wagner stayed for a year at Königsberg, during which time he composed two overtures, one on "Rule, Britannia," the other entitled "Polonia."

He then returned to Riga, his friend Dorn having obtained engagements at the theatre there both for his wife and his sister-in-law, and having offered him the post of *premier directeur de la musique*.

On December 11th, 1837, a benefit performance was given for Wagner at the theatre at Riga, and at his own request the opera then performed was Bellini's "Norma."

But Wagner was by this time tired of the barrenness of life at Riga, and longed to try his chance in seeking fame and reputation in the great Parisian capital, which seemed to him then the veritable abode of all true art. The spell was on him, and whilst writing the music for an opera comique in two acts, "l'Heureuse Famille d'Ours," he made the discovery that he was really doing nothing more than composing music "à l'Adam," and his disgust reached its height.

As a sort of preface to his intended journey to Paris he made a sketch-plan of "La Grande Fiancée," a novel by Henri Koenig, and sent it to Scribe, asking him to use this as material for a poem, and to be good enough to get the work accepted at the French Opera House.

With this consummate piece of impudence we will, I think, take leave of the young man, Richard Wagner.

On January 25th, 1866, Wagner, who was at the time at Marseilles, received the news of his wife's death, and on August 25th, 1870, two months after the performance of the "Valkyrie" at Munich, he was united at Lucerne to Madame von Bulow, *née* Cosima Liszt, the daughter of Franz Liszt and Madame la Comtesse d'Agoult. Madame Bulow was at this time twenty-nine years of age, and she had a family of four daughters, the eldest of the number afterwards married the Italian Count Gravina, and another was united to M. de Thode, of the University of Bonn.

Von Bulow, who up to this date had been Wagner's bosom friend and staunch supporter, on discovering his wife's desertion of him, exclaimed: "If it had been some one

that I could have killed, I should already have done the deed." But to him Wagner, though his betrayer, was sacred as the Genius of Music.

It is often said that genius is not judged by any conventional standard of morality, and this maxim seems to have been appreciated in all its fulness by the immortal Richard; looked at with ordinary eyes his second marriage was certainly more of the Mona Caird type than is generally considered desirable.

The fundamental principles which Schopenhauer has laid down, so far as music is concerned, for the metaphysical essence of the art, Wagner, without any modifications, has adopted as a basis on which to erect his own theories respecting the same. There are two sides to Wagner's artistic movement; one negative, the other positive. In the first instance, he has abolished the petrified formalities which, in the course of centuries, had gathered round the dramatic poem. His last and supreme purpose is the attainment of dramatic truth. The first excrescence of the opera which he attacked was the aria, which had, in the course of time, obtained undue importance. It need not be added that other forms of absolute music were also swept away by this modern reformer, but Wagner (and in this we have to recognize the positive side of his work) has at the same time erected a new form of musical expression, which originates from, and varies with, the impulse of dramatic passion. In one of his most important literary works, "Opera and Drama," Wagner urges the demand of a co-operation of all the arts, that is, of painting and sculpture as well as of poetry and music, in the drama of the future. When we look on Wagner we must remember that he was a dramatist as well as a musician, his stage directions being always of the minutest kind, and showing all that skill and knowledge of scenic effects which so favourably distinguish him from most other German dramatists.

Weber was the first of the so-called romantic school to engage in critical and æsthetical literature, but Wagner's fertility in this department exceeds anything ever before attempted. The results of his literary labours occupy no less than nine volumes, and besides these one may include such "miscellanea" as a collection of letters to the Mayor of Bologna on the stage; correspondence with Berlioz, Liszt, and others; and an autobiographical sketch extending to the year 1842. Consider also the enormous amount of painstaking labour expended upon the libretti for his operas, all of them the work of his own hand, and add to this the circumstance that a most intimate acquaintance with mediæval folk-lore and Scandinavian mythology was a primary necessity in their

composition, and you will gain a faint idea of this man's literary activity!

Wagner was also distinctly a poet—his whole nature and temperament were imbued with the poetic instinct—and though the form in which he has cast the dialogue of his great music-dramas may not accord with our preconceived notions of beauty, yet it was the most suitable to illustrate the impressions which were intended to be conveyed to the mind of the hearer. The alliterative principle which Wagner so largely employed is the metrical basis of all Teutonic poetry, and represents most nearly the "staff rhyme," as found in the Eddas and Sagas of the Northern mythology.

Wagner's position in musical history seems to me a somewhat unique one. He stands, as it were, in a niche of his own making. His peculiar tendencies may be said to have called forth a new class of singers, musicians, and *litterateurs*.

There is no doubt, as regards his relation to the new romantic school, that though Berlioz was the founder of the same, Wagner must ever be regarded as its first and foremost disciple, supporter, and adherent. Berlioz started the school, Wagner made it, threw into it all his life-work and full tide of rushing and tempestuous enthusiasm, and scored a brilliant second to Berlioz's somewhat uncertain first.

Wagner must ever be a remarkable figure in the history of the growth and development of music, for he marks a new era. He presents himself in so many and varied aspects—at one time we see him as a fierce controversialist and pamphleteer, at another as a poet, at another as a musician of extraordinary if mistaken powers, impatient of conventionality, and heedless of the prim-set confines and iron boundaries of musical form and expression, at one time as favouring the Italian school of melody, at another as scouting all connection with so degraded a form of art; at one time the companion of kings, at another correcting proof-sheets to earn his daily bread. The man is complex, intricate, many-sided, original; the artist is there though under various guises; the genius is unmistakable.

Wagner died on February 13, 1883, at the Palazzo Vendramini, at Venice, a house which was at that time the property of the Comte de Chambord. The composer had for nearly a year before this date been warned by many unmistakable symptoms of his rapidly failing health. On the day in question, Wagner was preparing to go out on his usual daily round in the gondola; but just before leaving the house he became engaged in some dispute which provoked him to one of those violent fits of temper which were an unfortunate attribute of his nature, and in the midst of his rage he suddenly jumped up, saying, "I feel very ill," and fell fainting

on the floor. He was at once carried to his bed, and his doctor, Doctor Keppler, was summoned on the instant; but all was over, and Keppler only arrived to find him a corpse within the arms of his wife, who thought him asleep.

Madame Wagner was only removed from the body after twenty-two hours had elapsed, and then gentle force had to be employed, so terrible was the prostration and anguish of her afflicted soul, and it is said that for nearly four days she would partake of no nourishment.

The real cause of Wagner's death was a rupture of the right ventricle of the heart, though many internal complications naturally hastened such a catastrophe.

The body was embalmed by Professor Hoffmann of Berlin. The funeral was at Bayreuth, at four o'clock on a Sunday afternoon. In the long train of the funeral cortège were three cars laden with more than 200 wreaths. King Louis, Wagner's generous and beneficent patron, was unable to be present; but the next day made a sad pilgrimage to the tomb, placing the floral offerings thereon with his own hands, a touching tribute from royalty to true genius. During the procession from the station at Bayreuth to Wahnfried, Wagner's residence, the funeral march from "Siegfried" was played, and the Lieder-Kranz of Bayreuth sang Wagner's composition written for the funeral of Weber.

Wagner was buried in the tomb he had prepared for himself in the garden at the back of his house. It is touching to note in connection with this sad ceremony, that just in front of the tomb was the grave made by Wagner for his faithful dog that was poisoned, and the musician had marked the spot by the simple inscription: "Here Russ lies and waits." Both master and hound are now removed from sight, but the memory of the one is as imperishable as the fidelity of the other.

Wagner's influence as regards his work and writings is widespread, and, to my mind, ever increasing. We even see a veteran like Verdi inexpressibly tinged if not saturated with this influence, and such works as "Aida" and "Otello" show us that, although the Italian composer has not forgotten his own legitimate school, with its broad and happy melodiousness, yet he has in the evening of his life been straying in pastures new, and is not above learning a thing or two when it is worth knowing. Professor Stanford is, to my thinking, a most able and vigorous exponent of the principles and traditions (if so young a school can have the latter) of the Wagnerian system. In Germany the performance of Wagner's works means for the management of a theatre or opera house pecuniary success, and in France there is a steady and increasing demand for excerpts from the composer's works.

In England, this unmusical and much-found-fault with country, Wagner at the opera house does not mean money, and we are reduced to Italian versions of the smaller works in order to ensure even a moderate amount of success. At the Richter Concerts and Henschel's Symphony Concerts people cannot have enough of Wagner; why, I don't know. I suppose there's a good deal of fashion mixed up with it, for I am morally certain that the English do not appreciate and cannot understand Wagner or his works. That is just where Wagner fails; his music-dramas are grand, they are colossal both in design and treatment, but we must have the whole thing complete—music, scenery, and all accessories of a like nature; or else, as a rule, we don't understand them. Wagner wants us to study his works, to think deeply about them, to prepare our minds for their proper reception, and that is just what the majority of English people don't like doing.

Of course, some of Wagner's music does well by itself, and I shall never forget the impression produced upon me on hearing the "Walkürenritt" performed at the Albert Hall under Wagner's direction. If ever dramatic action was embodied and personified in music, it may here be found in unparalleled force; and I should question whether in the whole history of music so vivid and startling a presentment of a pictorial image has ever been made simply by orchestral means. All such attempts to familiarize the English people with the works of Wagner, as, for instance, the performance of a whole opera on a grand pianoforte, with a small company of selected singers, are worse than useless, and disgust not only the uninitiated, but also all those who respect and reverence the memory of so great a master. I would also deprecate all such utterances as "There are two great masters in music—Beethoven is the one, and Wagner certainly is the other." Beethoven is the one certainly, the one and only one, and he is like a familiar figure in a sacred narrative, a head and shoulders above his brethren. And I doubt not that amongst those who would readily subscribe to this opinion would be found, could he now have utterance, the Musician of Bayreuth, Richard Wagner.

DISCUSSION.

THE CHAIRMAN.—I have now to invite the members of the Society to give us their opinions upon this interesting subject, which Mr. Cart has so clearly put before us, and I trust that we shall have a good discussion. Mr. Cart has told us that Wagner is not appreciated by the English people—*i.e.*, by the great body of the English people who are interested in music. I fear that at the first introduction of Wagner's music into England, the attempt to select short pieces from his works, which should be pleasing at a mixed performance, led to the production of the same pieces over and over again, because the number of such short pieces is so limited. The first great introduction of Wagner's music into England was made by himself and Herr Richter in those six grand performances, at the Albert Hall, of considerable portions of his more important works. Speaking as one of the general public, who has some little appreciation of music, I should say that there is a great fascination about Wagner's music. Before those Albert Hall performances I was not much interested and allowed the two first to pass, but went to hear the third performance, which I think included a considerable portion of "The Walkyrie." So struck was I with the power of Wagner's music, and so fascinated, that I was careful not to miss the other three performances, but heard them all, and they led me to regard Wagner as a very great composer and musician. Then came those larger and grander performances still of his works in a more complete form, his "Niebelungen Ring" and "Tristan und Isolde," and his other and better known operas, the repetition of which has shown that they at least are appreciated by the English musical world. I was greatly struck with one thing in connection with the Albert Hall performances. Wagner himself conducted during the first part of the performance, but was succeeded by that renowned leader Richter, who conducted during the second part. The change from Wagner to Richter was most marked in the effect produced on the performers. When Richter took the wand, it was as though he were playing every instrument in the orchestra, all the performers recognised and acted up to his masterly leading, and the effect was most startling and grand.

I will now ask you to give a vote of thanks to Mr. Cart for his interesting paper.

[A vote of thanks was carried unanimously].

Mr. SOUTHGATE.—I think there is very little I can say with regard to the paper which has been read, for one cannot in an audience of a mixed character such as is ours to day take a paper of this character and analyse it and criticise it as it deserves to be. We should be thankful to Mr. Cart for

the facts he has brought under our notice. Probably many of us knew most of them before, but he has put them in a succinct form that will be useful for future reference. Although Mr. Cart has not indulged in much criticism of Wagner's works, there was one statement he made that to me was a little surprising—namely, that Wagner whistled the concertos of Beethoven. What a marvellous compass his whistle must have had! I should imagine if he could have performed those concertos at the concerts at Drury Lane or Covent Garden, where the whistling lady was one of the attractions, he would have quite extinguished the *sifflieuse*. With regard to the popularity of Wagner in England, I think possibly Mr. Cart has underrated that to a certain extent. Among musicians, and in certain respects, his works are known and, I think I may venture to say, appreciated at their full value; moreover, there are certain of his operas which are, speaking generally, approved by the public. For instance, "Rienzi," "Lohengrin," "Tannhauser," the "Flying Dutchman," and the "Meistersingers of Nüremburg" are liked. The public go to hear them, and my impression is that these fine works pay fairly well. But some of his other operas, such as the "Niebelungen Ring," "Tristan und Isolde," and "Parsifal," are productions which English musicians are hardly prepared to accept. As to the reasons for that, it would take too long to go into; there are many. Novelty, of course, is the first cause. We know geniuses are always in advance of the age, and it is some time before we get used to them, their novelties and peculiarities, and we know that it has always been so. But does not one cause lie in the *libretti* and the extravagant stories that he has chosen for illustration? No doubt, to the German mind, conversant as are these people with these legends, such must appeal much more forcibly than to us. They accept them as readily as we accept the fairy tales of our childhood, but they are not known to English people, and consequently there is a certain amount of want of sympathy with the stories, especially in their lack of natural human action. Of course, we know that there are operas, such as Weber's, in which there has been to some extent supernatural, but still there is in most of these a certain amount of human interest. Now, in the Wagnerian subjects there is little of such sympathetic interest. These mystic legends, which have come down to us from early ages, seem to appeal more to Germans than to English people, and I cannot but think that is one reason why these later works of Wagner have not found the favour his early operas did. Then, further, there is the question of his last and most peculiar style—a very large question indeed, and on which we could hardly come to any sort of agreement. I was very glad to hear that, in grouping

the two composers, Mr. Cart gave Beethoven the pre-eminence. He should rightly have the pre-eminence, though one can hardly compare the two composers together. Still, as he has mentioned them by name, I will make one comparison, and that is this: we must never forget that Beethoven was an all-round genius—he produced symphonies, quartets, quintets, pianoforte sonatas, operas, oratorios, and so on. Now Wagner's works rest practically on what he calls the music of the Art Drama; therefore we are justified in classing him only as a dramatic composer. When the two eminent names are mentioned together, I say that here Beethoven must have pre-eminence. To my mind a genius, especially in music, ought to show his genius in every branch of the art. It has been so with Bach, Mozart, Schubert, Mendelssohn, Schumann, and certainly with Beethoven; but Wagner will not stand the test, and so he can only rank as a *genre* composer. There was one remark which struck me as hardly accurate with regard to Berlioz being the author of the romantic school. I should say that Weber was the founder of the romantic school. I think "Der Freyschütz" was the first work in which that quality was so distinctly manifest. Weber had gifts greater than Berlioz in that respect, but, of course, Berlioz lived after him, and was able to do that with the orchestra which Weber never dreamt of. Still, Berlioz's works are certainly romantic. Some portions of his "Queen Mab" music are marvellous pieces of imagery, and his skill and genius in dealing with an orchestra are indeed extraordinary. I cannot but think that had Berlioz not lived and given us the wonderful orchestration he has written, that Wagner could never have done the great work we all admit he has accomplished in the realms of orchestral music.

Mr. Webb.—I would remark that the popularity of Wagner must be accepted as an undoubted fact, even by unmusical people having little or no knowledge of music. The reason for this is difficult to discover. Wagner's music is not easy, it is not always melodious, and it is not easy to follow. The only thought that has occurred to me with regard to the reason of its popularity is that it is thoroughly artistic, that it is real and earnest, and that it more thoroughly expresses the emotions than that of any other writer. On the other hand, I think perhaps we attribute too much to Wagner. There are other writers, such as Scharwenka, whom I think we ought to consider. I doubt whether a hundred years hence Wagner will be credited with such great genius as very many attribute to him now.

Mr. C. E. Stephens.—I think it is hardly fair to English people to say we do not appreciate Wagner, because he is evidently now quite in the ascendant in popularity. But there

may be one reason, perhaps, which I should have liked to hear Mr Cart deal with, with regard to Wagner's slower advancement than would otherwise have been the case—and that is the almost superhuman demands which his works make on executive power. Anyone who attended the performance of the "Niebelungen Ring" will remember the superb effort of Madame Vogl in the part of *Brunnhilde*, which makes unreasonable demands on human resources. When an orchestra of some hundred musicians were playing their loudest, Madame Vogl towered above them all in splendid self-abnegation on behalf of the master; it was evident that that actuated her. But that is a sort of thing which cannot continue for ever; artists are, after all, mere flesh and blood, and they really cannot bear, I think, such very heavy demands as are made upon them by Wagner's works. I do not say a word in depreciation of the music of Wagner, but I say that the very great difficulty of its execution stands very much in the way in this country, and in others too, of its being appreciated. People show their readiness to appreciate the works of Wagner, but their extreme difficulty hinders their more rapid advancement. I cannot admit that England is behind any other country in appreciating what must be considered the genius of Wagner.

Mr. HERBERT.—I should like to call attention to three points of Mr. Cart's address. First, he thought all great musicians had bad tempers, but as against that I would think of Haydn, Mozart, and Mendelssohn. Then came a statement that the acts of great geniuses were to be judged by a different standard from the rest of the world, *apropos* to Wagner seducing his friend's wife. There I differ from him entirely. And in speaking of great musicians, he said that Beethoven was the first; but I think Mr. Cart forgot Sebastian Bach. I am a most uncompromising enemy of Wagner in every possible way, but at the same time I admit that I came to the task twelve years ago (in 1878) prejudiced; for all I had heard abroad from professional musicians, and all I had read in his works certainly prejudiced me against him. To mention one or two instances, he said that the music of "Don Giovanni" would one day not be worth the paper on which it was written. After that he could not, by any possibility, find any sympathy from me. Then there was the matter of the pamphlet containing the attack on Mendelssohn and Meyerbeer, and the rest. In fact, on the moral side, Wagner's character was such as to prejudice me very much against his compositions. I admit it. Pougin says, in the supplement to his Dictionary, how difficult it is—almost impossible—to separate a man from his compositions, and there I entirely agree with him.

Mr. SOUTHGATE.—It is impossible to hear what Mr. Herbert

says without feeling in unison with it, but, after all, we are only called upon to judge of Wagner's music, not of his morals. I think we must try and test his music alone, forgetting everything else. If we remembered the other things he has perpetrated, the Bayreuth master would undoubtedly be condemned by all right-minded people; but one has simply to judge by his music and estimate the artistic effect he has produced. I think we can only look at him in that light. His offensive attacks on Rossini, Mendelssohn, and Meyerbeer, and others of whom he was jealous, or not in sympathy with, were so ridiculous that no doubt he did himself a great deal of harm by them. Owing to outside matters of this kind it is very difficult to get people to look at his works in a fairly impartial spirit.

The Rev. H. Cart.—As regards the statement that Wagner whistled the concerti of Beethoven, I am not responsible for that, I was simply quoting the words of Dorn, his friend. I am afraid I was misunderstood with regard to the unfortunate second marriage, because, really, from my position, I could not advocate any such thing. I hinted that it would have pleased pupils of the school of Mrs Mona Caird, and I do not see how it could be supposed that I defended it. Mozart has been mentioned as a good specimen in the matter of sweetness and good temper, but I have reason to doubt that altogether. I think Mozart occasionally attacked people, as also did Wagner. Of course, I am quite ready to admit with anyone that Wagner did sometimes make himself thoroughly ridiculous: his vanity was, to my mind, a most contemptible, childish thing. I was very pleased to hear Mr. Southgate say that we were to regard him so far as his music goes, and let us judge him by that standard. As regards the difficulty of his works, that cannot be gainsaid in any way. They do demand superhuman efforts, and it is a misfortune that it is so, for that will be one reason to prevent their ever becoming popular in the sense of their being appreciated by the masses.

MAJOR G. A. CRAWFORD

In the Chair.

THE FLAT, SHARP, AND NATURAL.

A HISTORICAL SKETCH.

By Frederick Niecks.

The history of the flat, sharp, and natural is not a dull record, but a tale full of stirring incidents. If my narrative does not succeed in engaging your interest, in stimulating your curiosity, and in now and then sending a thrill of excitement through you, I have failed to do justice to the noble subject of my choice. These remarks may lead you to suppose that I am going to speak of the human flats, sharps, and naturals of our profession. This, too, is, if not a noble, certainly an interesting subject; but it is not the one of which I intend to treat on this occasion. My subject is the origin, rise, and vicissitudes of the musical signs that raise and lower natural notes and restore raised and lowered notes to their natural state. No doubt most people would suspect such a history to be dull; but nothing is dull if only we go deep enough into it. The subject in question is certainly not an exception to this rule, which could be confirmed by the study of hundreds of the apparently dry details of our notation. It is with these details as with the humble constituents of society; with the flat, sharp, and natural as with those lowly neighbours of ours whose lives seem to us an unbroken level desert. How great is always our astonishment when chance allows us to get a glimpse of what is hidden behind the plain, prosaic exteriors, and we discover loves and hates, hopes and disappointments, joys and sorrows, aspirations, successes, and failures—in short, at least as much romance as in the lives of the great and mighty. Well, let us try to get a glimpse of what is hidden behind the plain exteriors of the humble friends now under consideration.

The flat, sharp, and natural have a common origin, and this origin is the small letter *b*. If there were no direct evidence, this might be inferred from the mediæval names of these signs, which were respectively for the flat, *b rotundum*, round

b; for the natural, *b quadrum* or *quadratum*, square *b*; and for the sharp, *b cancellatum*, cross-barred *b*. But as there is direct evidence, we need not have recourse to inferences. John Cotton, who in the latter part of the twelfth century wrote a treatise on music, informs us that the oldest musicians, that is of the Middle Ages, gave to the monochord, or, as we of the nineteenth century would say, had in their system, only fifteen notes—namely, the diatonic notes from the great *A* to the second *a* above it. "There was neither added Γ," he says, "nor inserted the *b*, which we call round or soft *b* (*b rotundum vel molle*), but which by the Greeks is called synemmenon, that is, conjoint. The moderns, however, who are more subtle in all things, recognised that the number of notes which had been used up to their time did not suffice for the execution of all melodies."* The first known writer who distinguished between *b* natural and *b* flat was Odo of Clugny, who died in 942; the *b* natural being indicated by a square *b* (♮), the *b* flat by a round *b* (♭).† The famous Guido of Arezzo, who exercised so great an influence on the music of the Middle Ages, and on whom have been fathered so many inventions that had either existed before him or came into existence after him—as, for instance, the note Γ, our great G, and the harmonic hand—wrote about the second quarter of the eleventh century, in the second chapter of his "Micrologus," as follows: "The notes of the monochord are these: In the first place we put Γ, which the moderns have added. Then follow the seven low notes (*graves*), according to the alphabet, which, therefore, are indicated by capital letters, thus: A, B, C, D, E, F, G. After these the same letters are written again, among which, however, we place between *a* and h another *b*, which we make round, whereas we make the other square, in this way: a, b, h, c, d, e, f, g. To these letters we add yet, but with different signs, the superacute tetrachord, in which we double again *b*, thus: a, b, h, c, d.‡ a, b, h, c, d ‡

In the eighth chapter of the same work Guido explains why the round b was introduced. "The round b," he writes, "which, because it is less regular, is also called the added *b* (*b adjunctum*), or the soft *b* (*b molle*), forms a concord

* *Johannis Cottonis De Musica*, in Vol II. of Gerbert's "Scriptores ecclesiastici de musica sacra potissimum"

† "Præterea a voce sexta F per quatuor divide, et retro h aliam b. rotundam pone: quæ ambæ pro una voce accipiuntur, et una dicitur nona secunda, et utraque in eodem cantu regulariter non invenietur"—(*D Oddonis Dialogus de Musica*, in Vol. I. of Gerbert's "Scriptores ecclesiastici de musica sacra potissimum")

‡ *Micrologus de disciplina artis musicæ*, in Vol II. of Gerbert's "Scriptores ecclesiastici." See also *Micrologus Guidonis*, translated and explained (Latin and German text) by M. Hermesdorff (Trier J. B Grach), and German translation by Raymund Schlecht, in *Monatshefte für Musik-Geschichte*, Vol. V., p 135

with F, for which reason it has been added, as F cannot form a concord with the fourth note above it, the h, on account of the discrepant tritone. But the b and h should not be joined in one and the same phrase."

This is not all Guido says of the use of the round *b*, but we have not time to hear him out.

Thus far I have spoken only of the two *b's* as they occurred in the letter notation; now, what was done when they were written in the stave notation? The already once-cited John Cotton of the twelfth century, remarks with regard to this, that the two *b's* stand on the same line or in the same space, but that if *b* flat is intended, a round *b* has to be placed above the note in question.

The round *b*, however, was not only placed above, but also before the *b* natural that was to be lowered a semitone.

As musicians had found that a *b* flat was necessary for the satisfactory execution of their melodies, so they found before long that other modifications, sharpenings as well as flattenings, were required, especially in their harmonic combinations. It is interesting to note how the idea gradually dawned upon them, and how they struggled against the recognition of its true significance. For although they allowed these new notes to be used, they would not admit them into their system on equal terms with the other notes. The *b* flat had been thus admitted, but the other semitones obtained by flats and sharps came under the denomination "false music" (*musica falsa*), and at a later period, "feigned music" (*musica ficta*), and also, but more rarely, *musica inusitata*. We have here one of the most striking and astounding instances of self-deception—an instance of the human intellect eclipsed by a theory. We may well call it astounding, for more than 600 years were needed to eradicate the strange notion, which to us appears in the highest degree childish.

No less interesting than the self deception of the theorists and their followers is the clever utilisation which the early musicians made of the two forms of their *b*; for the round *b* came gradually to be used with other notes besides *b* that were to be flattened, and a happy thought suggested the employment of the square *b* for sharpening notes. The forms of our natural and sharp are nothing but variations of the square h, and owe their existence simply to careless writing. By making the short vertical line of the square *b* (h) a little too long we get our natural (♮); by making the two vertical lines of the square *b* quite or nearly equal, and the horizontal lines long enough to extend beyond the vertical ones, we get our sharp, the cross-barred *b*, the *b cancellatum* of the olden times. Both signs, the natural and the sharp, were concurrently used with the same meaning.

Although at a later period—but never generally—there was a distinction made in the use of them, it was not till the eighteenth century that these signs were thoroughly differentiated, and their powers strictly defined and established as we at the present day know and acknowledge them.

Now let us return to the mediæval theorists. Johannes de Garlandia, who probably wrote in the first half of the thirteenth century, is already quite on the modern standpoint in dividing all tones into semitones. He says: *Falsa musica* (which is very necessary for instruments, especially for the organ) arises when we take a semitone instead of a tone, or the reverse. Every tone is divisible into two semitones, therefore the number of the signs which indicate the semitone may be increased in all the modes."*

Walter de Odington, who wrote somewhat later, probably in the last quarter of the thirteenth century, does not go quite so far as Johannes de Garlandia, but he adds to *b* flat, which, as we have seen, formed part of the regular system, the notes *f* sharp, *c* sharp, and *e* flat, saying, the double *b* effects, according to the moderns, a double *f* and a double *e*, and the double *f* effects a double *c*, in order that for both perfect fifths may be found. He explains also how the raising and the lowering of a note a semitone is indicated respectively by a square ♮ and a round *b*, and adds: "The two *b*'s belong to the monochord; the other alterations are called by musicians *falsa musica*, not because they contain anything dissonant, but because they are outside the disposition of the monochord, and were not used by the ancients." †

Philippus de Vitry, of the fourteenth century, produces an example with ♮ and ♭ on all lines and in all spaces.‡ Another writer of the fourteenth century, Johannes de Muris, says that the false mutations (*mutationes falsæ*—that is, the chromatic alterations other than the *b* flat) are contrary to the character of plain-song, but that it is otherwise with mensurable song (by which we have to understand "harmonic music"). He discusses also the question whether a semitone should be inserted between the low *A* and *B*, and remarks that this was done in the case of some artificial instruments, such as the organ, in which almost all the tones are divided into unequal semitones. But he thinks that this is not so useful for the human voice.§

* *Introductio Musice secundum Magistrum Garlandia*, in Vol I., p 166, of Coussemaker's "Scriptores de musica medii aevi."

† *Fratris Walteri Odingtoni De Speculatione Musice*, in Vol I., p. 215, of Coussemaker's "Scriptores"

‡ *Ars Contrapunctus secundum Philippum de Vitriaco*, in Vol III., p. 26, of Coussemaker's "Scriptores"

§ *Johannis de Muris Speculum Musicæ*, in Vol II., pp 294 and 271, of Coussemaker's "Scriptores"

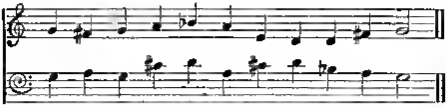
The absence of the low B flat from the mediæval theory has its explanation in the then flourishing hexachord system, according to which series of six notes, with a semitone between the third and fourth degree, were started from the notes *G*, *c*, *f*, *g*, *c'*, *f'*, and *g'*. The *b* flat was required for obtaining the semitone in the right place in the hexachords starting from *F*; but there was no low *F* (only *f* and *f*) and hence no need for a low *B* flat. This was the theory. And the low *B* flat remained absent from the system for hundreds of years after the note was in practical use. Here we have another instance of the conservative propensities of the human mind. Or should we say, of the intellectual inertia of the musical profession?

There is a remark of Johannes de Muris which deserves to be dwelt upon for a moment or two—namely, that the chromatic alterations of notes are contrary to the character of the purely melodic plain song, but not to the harmonic mensurable song. This distinction has to be borne in mind; it is of great importance. One of the greatest authorities on both these kinds of music, Franz Xaver Haberl, the editor of service books and of the complete works of Palestrina, delivers himself on this point of the following opinion: "As the Gregorian chant as such is always executed *unisono*, the laws for the formation of cadences in two-part counterpoint are not at all applicable to it, and there is no other rule than this: except a flat before *b*, in order to avoid the tritone, no sign of sharpening or flattening is allowable in Gregorian chant."

This is the view taken by one who belongs to the party that insists on a strictly diatonic execution of plain-song. But there is also a party that favours a certain amount of chromaticism. The question is one of taste rather than of history. No doubt plain song was at first strictly diatonic, but as soon as chromatic notes came into use elsewhere they could not easily be kept altogether out of plain-song. If some resisted, others would succumb to the temptation. This is not only according to reason, but, I think, may be gathered from the contradictory and often ambiguous accounts that have come down to us.

Even if we grant the admissibility of certain modifications of the radically diatonic plain song, there remains still a great difference between it and harmonic music with regard to the amount of accidentally sharpened and flattened notes, with regard to the amount of the so-called false or feigned music. *Musica ficta* has been said by an anonymous mediæval writer to have been invented on two accounts—out of necessity, and for the sake of beauty. In harmonic music dire necessity made itself naturally more strongly and more frequently felt than in the purely melodic plain-song, and also the desire for beauty, for a smoothing down of the sharp corners of diatonicism.

Musica ficta, says another mediæval theorist, has been contrived for the purpose of obtaining good consonances, and of avoiding bad ones. Franco de Colonia writes: "When the *discantor* cannot get useful consonances by right music (*rectam musicam*), he may at his pleasure make false music (*musicam falsam*)." These statements are too general to tell us much. Let us go for some particulars to Prosdocimus de Beldomandis, who wrote at the beginning of the fifteenth century: "As to the use of these signs—namely, the round ♭ and the square ♮, you must know that they are applied to octaves, fifths, and similar intervals in so far as these require to be enlargened or lessened in order to make good consonances of them if they be dissonant, because such combinations should be in counterpoint always major and consonant. But these signs must also be applied to imperfect consonances, such as thirds, sixths, tenths, and the like, as they require to be enlarged or lessened in order to make them either major or minor, for these combinations must be in counterpoint, now major and now minor. If you wish to know when they are to be major and when minor you must consider the degree to which you intend to proceed immediately after such an imperfect consonance, and then you must see whether the degree which you leave lies farther away from that to which you intend to proceed if you make this imperfect consonance major or if you make it minor. For you must take that which is less distant from the degree to which you intend immediately to proceed, be it major or minor, and you must make them such by means of the above named signs—a major of the minor, or a minor of the major—according to the requirements of the case. The reason is no other than a more pleasing harmony. But as this more pleasing harmony results from it, this reason can be regarded as sufficiently convincing. For if it belongs to the nature of the imperfect to strive after its perfection, which cannot be otherwise than by its approach to the perfect, the conclusion is that an imperfect consonance becomes the more perfect the nearer it approaches a perfect consonance, and also that thereby a more pleasing harmony of the song arises."* And then Prosdocimus de Beldomandis gives the following example:—



* *Tractatus de Contrapuncto*, in Vol. III, p 199, &c, of Coussemaker's "Scriptores"

This is a very clear, simple, and comprehensive doctrine, which, however, raises a number of uncomfortable questions. Did it correspond to the prevailing practice? And, if the practice corresponded to the doctrine in the first quarter of the fifteenth century, did it do so in the remaining part of this and in the sixteenth century? And, further, if the practice of Italy corresponded to it, did that of other countries do so likewise? Unfortunately, answers to these questions are not forthcoming, for no other theorist before or after Prosdocimus de Beldomandis has been so outspoken as he. Now, one unacquainted with the history of music might here ask: Why make so much ado about theorists and their opinions? Have we not works of art in which both the theory and practice of their time and country must be embodied? Ah, here is the rub. The old compositions embody these things but very incompletely, as the necessary accidentals are either entirely wanting or imperfectly indicated. Nay, not only were the necessary accidentals omitted, but accidentals which had no business to be there were sometimes introduced—namely, for the purpose of warning singers not to sharpen or flatten notes in circumstances where they were accustomed to do so. Imagine the stupefaction of an uninitiated modern in coming across an *e* with a sharp and an *f* with a flat in those venerable works of the past! Even when the Italians and the French had become a little more liberal in the use of accidentals,* the Netherlanders and Germans kept true to their old reticence, and when works published in the former countries were reprinted in the latter, it was not an uncommon thing to omit the accidentals of the original print.† In an Italian manuscript of the fourteenth century occur the words, "False music ought not to be indicated" (*Non debet falsa musica signari*); and the Italian Pietro Aaron says in "Il Toscanello in Musica," the first edition of which appeared in 1523: "Accidentals are not needed by learned and practical singers, but are inserted only for inexperienced and unintelligent ones." In fact, the musical profession of those days, to all appearance jealously guarding the secrets of its craft, reminds one of what is told or fabled of the mason brotherhoods of the Middle Ages. The object of the accidentals, which the composers wholly or partially neglected to indicate and the singers had to supply, was a compromise between the modes (the ecclesiastical scales) and euphony. That this compromise is not likely to have been made on the same terms at all times, countries, and schools, is a proposition that needs no demonstration. Much

* The English composers were particularly careful in the use of accidentals.

† See in this connection and on the use of accidents in early times articles by Robert Eitner in *Monatshefte für Musikgeschichte* III (1871) 133, XIX (1887), 20, XX (1888), 75.

has been learned and much will be learned by carefully gathering and putting together the bits of information scattered here and there, the hints in the treatises of the theorists, the occasional, real, and cautionary accidentals in the works of the old masters, and the practice of the composers who wrote in German tablature, where accidentals received more attention. Nevertheless, it is hardly to be expected that editors of works of the Middle Ages and of the sixteenth and part of the seventeenth centuries will agree much better in the future than they have done in the past. The existence of the compromise will no longer be denied by any reasonable man, but there will remain open the question of what nature that compromise is, which side, the modes or euphony, is to be favoured, what shall be the amount of accidentals allowed in each individual case.

I shall now quote what Dr. Carl Proske, the editor of "Musica Divina," says on the subject of signature and accidentals. His conclusions with regard to these latter were arrived at by a thorough study of a manuscript collection of sacred music made in the sixteenth century for the Duke of Altemps at Rome, which was carefully prepared for practical use by the addition of accidentals, the additional accidentals being distinguished from those of the composers by being placed above the notes. "The old writers," says Proske, "did not require any chromatic sign in the signature of their modes in their natural position, but put in the signature a flat when they transposed them a fourth higher. Another essential signature of this kind could, according to the laws of those modes, never take place. Now, there frequently occurred in the modulation of a piece the employment of accidental intervals (♯, ♭, ♮), in the indication of which the old writers, otherwise so correct, proceeded in a very imperfect and uncertain manner. To be sure, they saw in such a raising and lowering of the intervals, in so far as they were not demanded by the nature of the modes, something extra-essential, and consequently called the signs used for that purpose accidentals, and the practical carrying out of them *cantus fictus*. Now, some, especially in the earliest times, omitted altogether the insertion of such signs; others inserted here and there a ♭, but avoided the indication of the requisite ♯ (diesis); later on these signs came more into use (the ♯ was generally substituted for the ♮), but a normal completeness of their indication is almost nowhere to be found. For the singers of the earlier times the want of the indication may have been less felt, for they possessed a thorough knowledge of the melody and harmony of the old tonal system, and could ascertain from the laws of solmisation and the harmonic modulation [*Ausweichung*] (the modulation of our modern modes is not applicable to this) a correct use

of the accidentals." He then gives four rules for the supplying of the necessary accidentals. Here they are in an abbreviated form. (1) and chiefly. The perfect cadence at the end of a piece, and the imperfect ones occurring in the course of it must be always preceded by the leading note. (2) To avoid false relation, the augmented fourth and diminished fifth have to be modified. There are, however, frequent exceptions to this rule. (3) When in the scale of *C* the note *b* is preceded by *a*, and descends immediately after, this *b* is to be flattened, especially if it returns to *a*. The same takes place in the scale of *F*, with one flat in the signature, where *e* is flattened in similar circumstances. (4) A minor sixth proceeding to the octave is often changed into a major one.

The temptation to pursue this subject farther is great, but I must resist it as I have already dwelt on it too long.

Proske's remarks have brought us to the end of the sixteenth century. But, before we proceed, we must look back for a moment, and take note of some of the details which we have disregarded in our general view of this part of our subject. Coussemaker's "L'Art harmonique aux 12e et 13e siècles," for instance, contains several harmonic compositions of the twelfth century in the signature of which, occupying the space of the note *f*, is a square *b*, formed like our natural and having the power of our sharp. In one case, one of the three parts of a composition has even two square *b's* in the signature, calling for *f* sharp and *c* sharp, whilst the two other parts have at the same time only one. Then we meet with an unexpected employment of accidentals. Some time after the occurrence of a *c* with a square *b* (♮) before it, the same note recurs with a flat. And the same occurs in another composition with *f*.* Now, that is not at all according to the general practice that prevailed soon after and down far into the seventeenth century. The rule being that the accidental applies only to the note before which it stands, and to the immediate repetitions of that note; if one or more other notes come between two notes of the same name, the accidental loses its effect. This rule remained in force even after the introduction of bars. At an earlier period, however, there was an exception to the rule; the round *b* being at times treated somewhat like our signatures, holding good till revoked by a square *b*. We find in the specimens which Coussemaker gives of the harmonic music of the twelfth and thirteenth centuries also the practice of placing an accidental not immediately before the note to which it applies, but before the preceding note, or even before the note preceding the preceding note. This practice, too, continued for a very long

* The flat having here the force of a natural, recalling the preceding accidental.

time. Lawes' "Ayres and Dialogues for one, two, and three voyces," published in 1652, supplies an example of a bar intervening between the accidental and the note to which it applies, that is to say, the accidental stands at the end of one measure and the note at the beginning of the next. To return to Coussemaker and his early specimens, we meet in them with a peculiarly shaped flat, being somewhat like a square *b*, with three sides of the square leaning downward on the right side, thus: ♭ This is, with one exception, the most striking of the numerous but generally slight variations of the form of the flat I have seen. The exception I found in a manuscript volume in the British Museum containing "In Nomines and other solfainge Songes," by Taverner, Tye, Mundy, Philipps, Byrd, and others. It might be described as an angular capital B with an elongated vertical line, thus:—

If the Latin treatise of the thirteenth century included in the "Histoire de l'harmonie au moyen age" is correctly printed by Coussemaker, the writer used besides the flat both the natural and the sharp, and used these latter in the same sense. For we find the note *b* with a square and with a cross-barred *b* before it, and so we do *f*. One of these signs is revoked by a round *b*.

A composition of the thirteenth century, a Rondeau, "Fines Amourettes," by Adam de la Halle, is interesting for the form of the sharps it contains. Ambros says in his History that the sharp had here this form ♯. But that statement is not borne out by Coussemaker's fac-simile, where the sign presents itself thus ♯, and thus ♯. There is a still more interesting form of the sharp (Plate xxxvi.) in a fac-simile of a composition of the fourteenth century. It shows clearly how the square *b* (♮) became a cross-barred *b* (♯). The form of it is this, ♮.

The old form of the cross-barred *b*, the one that is identical with our sharp, was subsequently supplanted by the double St. Andrew's ♯, I suppose because this latter stood out more boldly from the stave. In the sixteenth, seventeenth, and a great part of the eighteenth centuries, this form of the sharp was the one commonly used. An exceptional form of the sharp—namely, ♯♯—is to be found in Palestrina's "Hymni totius anni," printed at Rome in 1589. In Henry Purcell's "Sonatas of three parts," printed in 1683, a sharp like ours is used, but with larger and more slanting cross-bars, thus ♯.

The square *b*, our natural (♮), fell into disuse. The composers either used only the flat and the sharp, or used also the

natural, but to a limited extent. The limitation, however, was not always the same. Some used it only in connection with *b*, others also with *f*.* The distinction made in these cases between a square and cross-harred *b* is explained in the third volume (page 30) of Michael Prætorius's "Syntagma musicum," published in 1619. From this writer we learn that the square *b* is properly placed before the *b* flat in the transposed system when this note has to be raised in order to obtain a perfect fifth to *e*, and before *f* in the regular, non-transposed system when this note has to be raised in order to obtain a perfect fifth to *b*. The raising here required is equal to a full semitone, whereas the raising required for the change of a minor third or sixth into a major is less than a semitone. Our use of the square *b* (♮) as a natural, as a revoker of flats and sharps, cannot be traced farther back than the end of the seventeeth century, and was not generally established till about the middle of the eighteenth.

As we have already seen, the old composers put, as a rule, no sharps in the signature and no more than one flat. But there were occasional exceptions to this rule. In addition to the early examples cited by me, I shall mention two of the first quarter of the sixteenth century, cited by Dr. Hugo Riemann in his "Studies to the History of Notation"—viz., Josquin's "Le Serviteur," with two flats, and Okeghem's "Prennez sur moy," with three sharps. The manuscript volume of which I spoke a little while ago supplies likewise examples with two flats.

In the second half, and more markedly in the last quarter of the sixteenth century, the composers began to be more liberal in the use of accidentals. And this was the case not only with rampant chromaticists like Gesualdo, Prince of Venosa, whose music swarms with accidentals, but even with what we may call the classical composers of the time. Burney noticed the first A sharp in a composition by Orlando Lasso published in 1655, and the occurrence of A sharp and A flat in the same movement in a composition by Cipriano de Rore. This change in the notation was simply an inevitable consequence of the great changes that were then going on in the nature of our art—the change from diatonicism to chromatico diatonicism, the change from the old to the new tonality, the change from the polyphonic to the recitative and arioso style, and all the changes implied in the rise of the musical drama and the advance of instrumental music.

Ludovico Viadana, one of the leading spirits in the new movement, says in the preface to the "Cento concerti ecclesiastici," published in 1602: "The greatest diligence has

* See what Adlung says on this matter in the quotation given farther on.

been used in indicating all the accidentals—♯, ♮, and ♭—where they are required, and the prudent organist [whose duty it was to execute the thorough-bass] ought to be careful to observe them." Having pronounced the word thorough-bass, *basso continuo*, I will remind you in passing of the fact, well known to you, that when a minor third was required in the harmony, it was indicated by a flat above the bass note, the major third being indicated by a sharp. This was a general practice. But we find in Viadana a practice which became less general. An accidental applying to the bass note itself he placed before it, an accidental applying to the third of the unwritten harmony he placed sideways, somewhat to the left of the bass note, and on the line or in the space where the third would be noted.

But although Viadana is particular in indicating the accidentals, this had not yet become the general practice. Michael Prætorius wrote in 1619 as follows: "The cross-barred *b* (♯) and the round *b* (♭) were either not at all or very rarely marked by the chief and most excellent old composers in the places where they were nevertheless necessary. And even now there are composers who adhere to this practice and think it is wholly superfluous. They pretend that every singer and musician knows that he has to sing or play a perfect fourth and fifth when he meets with an augmented fourth and a diminished fifth, and a semitone in the cadences, and likewise a semitone when the melody ascends only one note above *la*. For this reason Philippe de Monte and other more distinguished composers will not allow their pupils to indicate in such cases the round *b*. But I am of opinion that it is not only convenient, but also in the highest degree necessary, not only for singers so that they may not be put out in their singing, but also for the simple town instrumentalists and organists who do not understand music, and are still less able to sing properly, and consequently, as I have myself often seen and experienced, do not know what to do in this respect; not to mention that the nature of the composition of composers is such that in some places these two chromatic signs have to be applied and in others must be disregarded. Therefore the best course would be if the composers were to write them down distinctly in all places where they are required, then it would no longer be necessary to ponder and doubt.' Prætorius's remarks throw much light on the execution of music in his time, and whoever takes up the compositions of Frescobaldi, the great organist and composer of the first half of the seventeenth century, cannot fail to sympathise with the view expressed by the German writer. For they contain many sharps and flats, but not enough, and we of the nineteenth century are at a loss

what quantity we may and ought to add. Let us hear what Haberl, the editor of a collection of pieces by that composer, has to say on this head: "A much debated question in the case of Frescobaldi is that of the so called accidentals (♯, ♭, and ♮) that are not marked, but were probably executed by him. Only in some obvious places have I indicated them by small signs above or below the notes in question. Some passages and harmonic combinations appear hard and unbearable, but they are not improved by accidentals, and false relations as well as chromatic dissonances were at that period by no means unheard of."

Every age is of course a period of transition. In the matter of flats, sharps, and naturals, the seventeenth century was this in the highest degree. Things were in an unsettled state and no serious attempts were made to settle them. No doubt some things were settled, but these were exactly those that required to be unsettled. Let us take a look at one or two things.

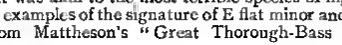
Burney tells us that Carissimi never wrote a sharp, and never more than one flat in the signature, even though the keys demanded several. The same may be said of many of his contemporaries, the younger as well as the older, not to speak of his predecessors. It holds good of Cavalieri's "Rappresentazione di Anima e di Corpi," of Caccini's and Peri's "Euridice," of Gagliano's "Dafne," of Monteverdi's "Orfeo," of Cavalli's "Giasone," of Cesti's "La Dori," and other works. For instance, in the last-mentioned opera we meet with the keys of D major, A major, and B minor, and with B flat major and C minor; but in the keys with sharps there are only accidentals, and in the keys with flats no more than one flat in the signature. But key-signatures with more sharps and flats are to be found early in the seventeenth century, and especially later on—for instance, a composition with two sharps in the signature, by Adriano Banchieri, of the year 1603. For a long time the number of two sharps or flats in the signature was not exceeded *whatever* the key might be. Thus we find in Alessandro Scarlatti's Opera, "La Rosaura," produced about 1690, A major with two sharps. But we find there yet other inconsistencies: D major with two sharps, but B flat major with one flat; D, G, and C minor with a flat less, and E and B minor with the correct number of sharps in the signature. By and by three sharps were sometimes put into the signature. But as late as 1728, the composer and theorist, Heinichen, wrote that the fourth sharp in E major was *rarely* put into it. And in the same work he complains of the incorrect notation of the modes by the omission of the essential major seventh and minor sixth. Most of our dictionaries and other books of information are silent on this

interesting point in the history of notation, and the few that take notice of it make inadequate, if not absolutely misleading, statements. One tells us that the last flat or sharp was frequently omitted; another that frequently one sharp was omitted, and a third, that in the minor keys the composers placed one flat less in the signature. The fact is, that the signature of the major as well as the minor, of the keys with sharps as well as the keys with flats, was often defective, and that there was no generally accepted system in this defectiveness. That there was no system may be proved by the following particulars. Couperin in his "Pièces" of 1713, writes the signatures of the major keys correctly, but puts one flat or sharp less in those of the minor keys. Taking up Pepusch's score of Corelli's Sonatas and Concertos, we find G, D, A, E, and E flat major, with one sharp or flat less, but F major with one flat, D major with two sharps, and B flat major both with one and with two flats. As to the minor keys, E, B, F sharp, and D minor are correctly marked; but G and C minor have one flat less, and F minor two flats less than they ought to have. Turning over Corelli's Op. 5, which is not contained in Pepusch's score, we find the following variations: D minor with one flat, A major both with two and with three sharps, and B flat major again with one flat. Some Concertos of Vivaldi's have in the keys of G, D, A, F, and B flat major, E, B, and D minor, the full complement of sharps and flats, but one flat less in E flat major and G minor. Again, in a book of Concertos by Giovanni Matteo Alberti, we come on F major with a flat, on G major without a sharp, on D major with two sharps, and on B flat major without the second flat, on E minor with a sharp, and on D minor without a flat. The signatures in Torelli's compositions are equally incalculable. Flying in desperation to the theorists, I thought, after much searching, that I was going to get what I wanted in a book published in 1708 by Friedrich Erhardt Niedt. Alas! another disappointment was awaiting me. Here is what I found. A major with three sharps, E major also with three sharps, and B major with four; E, B, and D minor correctly marked, and G, C, and F minor with one flat less. Gentlemen, I invite you to evolve a theory out of these facts; I, myself, feel constrained to admit my incompetence, and I need hardly add that I do so with the greatest possible reluctance. This unsatisfactory state of matters came to an end, roughly speaking, about the middle of the eighteenth century, but many composers had before then adopted a better practice; some, on the other hand, continued for some time yet to pursue their evil courses. A pleasing contrast to all this confusion is to be found in the eighteenth edition of John Playford's "Introduction to the Skill of Musick," of the year 1724,

where the keys given have the correct signatures; but the number of keys given is limited, comprising only the keys with one, two, and three sharps and flats, the major key with four sharps, and the minor key with four flats, of which E major and F sharp minor are said to occur only sometimes. As to the other keys, the author remarks: "There may be more thought on to puzzle young beginners, but not of any use, here being variety enough to please the ear."

In connection with key signature, one peculiarity has yet to be mentioned—namely, the repeating of the sharps and flats if more than one note of the same name was to be found on the stave, the space below and above being generally included, sometimes also the first ledger line:—

As long as composers did not write in keys with many sharps and flats, and did not even mark every one of the few in the signature, this accumulation was unobjectionable—nay, even praiseworthy; it was otherwise when keys with more sharps came to be used, then a state of matters arose that was akin to the most terrible species of nightmare. Here are examples of the signature of E flat minor and C sharp major from Mattheson's "Great Thorough-Bass School" of the year 1731:—



Here has also to be mentioned that the place of the signs in the signature was not fixed as it is now—for instance, the sharp for the note *f* stands sometimes in the first space instead of standing on the fifth line, the sharp for *g* on the second line instead of in the first space above the stave. In short, the succession and position of the several sharps and flats was variable.

I spoke of composers not writing in keys with many sharps and flats. Saint-Lambert, in his "Principes du Clavecin" of 1697, says there were only three scales with sharps—G, D, and A major. And Mattheson wrote so late as 1731 that he had never seen a piece in E flat minor, and from another remark it appears that, if he had seen one in G sharp minor, it must have been a great rarity. You remember the quotation bearing on this point which I made from Playford's "Introduction."

The placing of accidentals *in the course of a piece* was no less curious than the placing of sharps and flats *in the signature*. "Parthenia, or the Maidenhead of the first Musick that ever was printed for the Virginal," the date of publication of which is 1606, shows accidentals placed before, below, and

above the notes. This was not an exceptional proceeding. Christopher Simpson does the same in "The Division Violist" of the year 1667. And Saint-Lambert, as late as 1702, writes that they are placed generally before, sometimes above and below, but never after the notes to which they apply. However, in Lock's instrumental music to *The Tempest* we find also accidentals placed after the notes to which they apply.

The long-obtaining practice of permitting the accidental to be separated from the note to which it applied by one or more notes, and of the occasional occurrence of an intervening bar, has already been mentioned.

Among the matters which the first half of the eighteenth century had to settle was the use of the natural. Adlung writes in 1758 that the natural was formerly used only before *b* flat and *e* flat. But mostly it was either not used at all or synonymously with the sharp—the flat reducing sharpened notes to their natural position, and the sharp doing the same for flattened notes. Loulié, a French musician, was the first who, to my knowledge, taught our use of the natural. He distinctly propounded in 1698 that a sharp raises a note a semitone, a flat lowers it a semitone, and a natural brings it back to its normal position. However, he immediately gives an example in which a flat revokes a sharp, and comments on this thus: "Note that a natural has the same effect." Indeed, many decades had yet to pass by before our use was established. For even in 1760, Rameau, who had for about thirty years been in the habit of using naturals in the modern way, writes in his "Code de Musique": "People are still pretty much in the habit of recalling the sharp by the flat and the flat by the sharp." Leopold Mozart, on the other hand, says nothing of the old style in his "Violin School," published in 1756.

In Loulié's time accidentals still applied only to the note before which they stood and those of the same degree immediately following. And this question has, even at the present day, not yet been settled. The usual rule in the latter part of the eighteenth century was that all the notes of the same name in the bar were affected after an accidental, and if the last note was one of these notes and the first note of the next bar of the same name, the latter was likewise affected. Later theorists limited this part of the rule to tied notes.

Next we must consider the introduction of the double flat and the double sharp. At first musicians had recourse to the next natural note—for instance, substituting *g* for *f* double sharp, *a* for *b* double flat. The learned theorist and excellent musician Mattheson tells us in the second edition of his "Great Thorough-Bass School" that in the first edition he had done this in the case of double sharps; but dissatisfied with this illegitimate proceeding, he now placed two sharps

before the notes in question. He does this because he has not the necessary type for the special sign which he had already proposed for the purpose—namely, a single St. Andrew's Cross. The composer Marcello opposed, in the preface to the third volume of his Psalms, the introduction of this sign, because it had already another signification, that of the enharmonic diësis. Leopold Mozart gives in 1756 two forms of the double sharp: + and X. In 1758 we learn that its convenience had already made the latter the most fashionable form, and thus it has remained. Other forms had been proposed, but without finding favour. Here are two: X and ♯♯.

No special sign has been introduced for a double flat, although Mattheson proposed the Greek β. Sorge's proposal, made about the middle of the century (1745-7, in "Vorgemach"), of a special sign for a double natural failed likewise to find acceptance. It was this $\natural_{\flat}$.

To one other matter I must yet allude. The Germans had in former times no special names for flattened notes except *b* flat. They gave to *d* flat the same name as to *c* sharp, to *e* flat the same name as to *d* sharp, and so on. We read, for instance, in the theory books of the time, that the chord of E flat major consists of the notes *d* sharp, *g*, and *b* flat. How did this ridiculous custom come into being? You know there was a kind of letter notation called German tablature or German organ tablature. Well, in that system they had only one chromatic sign, a curved line or flourish added to the letter, answering to our sharp. So anyone writing in this notation had to substitute a sharpened note every time he wished to write a flattened one. This is the little-known solution of the riddle. Afterwards the syllable *es* was introduced to distinguish the flattened notes by name from the sharpened notes, which were already in possession of the syllable *is*. But this innovation was not brought about without difficulty, as the writings of the first half of the eighteenth century show us. Another curiosity are the German names of *b* for *b* flat and *h* for *b* natural. This is simply a case of mistaken identity. Even without going farther back and without studying old styles of handwriting, a black letter *h* cannot fail to strike you with its similarity to the square *b* and our natural.

I have not said all I wished to say, and a very great deal more than I could say is needed to make my slight sketch a finished picture. But I must conclude, having indeed kept you already too long, for though there was no lack of incidents in my account of the brothers flat, sharp, and natural, your faces, which I have been anxiously watching, showed me but too clearly that the thrills did not come off. Gentlemen, I thank you for the patient hearing you have given me.

DISCUSSION.

THE CHAIRMAN.—Ladies and gentlemen, in opening any discussion on the lecture I will only make one or two remarks. I am perfectly certain that to any of us who have at any time indulged in the pleasure of investigating old music, printed or in MS., Mr. Niecks's remarks will be of very great use, for in printed music down to a comparatively late period we often find some of these curiosities of literature to which he has referred. I have often wondered how people in those days were ever able to read anything correctly at all, or to know at sight what the music was intended to represent. The habit of placing the accidentals at some little distance away from the note it was intended to qualify continued, I know, up to about 1700, for I have seen it in music of that date, and sometimes it is very puzzling to know what note is really affected, especially when the printer has made a mistake as well, and put the accidental in the wrong place. It was often placed not merely at the beginning of the next bar, but at the distance of several notes, and to that was sometimes added the difficulty occasioned by the notes not being in their proper relative places. I have seen a book printed in Germany in 1690, in which the treble finished at the end of the staff, while the bass, not being able to be crammed into its proper place, was turned over for some distance into the next staff, so that it was a very difficult matter to find out which notes of one part were intended to go with those of the other part.

Mr. C. E. STEPHENS.—I think we have to thank Mr. Niecks very much for this interesting paper, and we also understand his regret that he could not have extended it to considerably larger proportions, so as to embrace many questions which he has been utterly unable to touch upon. One point I should wish to refer to in music printing is the absurd method that until very recently prevailed of contradicting a double sharp or flat by putting a natural and a sharp, or a natural and a flat, after it. Of course that is like the old system in which, if there was a sharp in the signature and a natural was required, it was indicated by the use of a flat. That was common, even in Handel's time, for I have found it in his cantatas. If in the key of G, and F♮ were desired, it would be indicated by a flat, and, in the figured bass, curiously enough, it is put after the figure. But of all the absurdities of even quite modern times there is that mode of contradicting the double sharp and double flat, a point which I think is not much touched upon in the paper.

Mr. NIECKS.—No, I did not mention the modern practice at all.

Mr. C. E. Stephens.—It seems to me the only thing necessary is to put the sign of what is actually required, and the thing then is plain and straightforward. It must be a matter of surprise in these days that we have not a single sign to indicate a double flat. It would be very desirable, but certainly not the sort of signs instanced by Mr. Niecks, which are most complicated. I remember a gentleman, an amateur, who some years ago looked upon these sharps and flats and double sharps and double flats as an invention of the ill-natured profession to try to bother the amateur; but he said it did not succeed in his case, for he never took the slightest notice of them.

Mr. Higgs.—I was reminded, when Mr. Niecks was speaking, of Handel's method of expressing a double sharp in a figured bass by the use of a single sharp. A double sharp never occurs when there is already a single sharp in the course of the piece. In the first song in the Oratorio of "Susannah," with its signature of four sharps, there is a modulation into G♯ minor, and it is expressed by a single sharp over the D♯—F𝄪 is of course intended.

Mr. Jacques.—I have to thank Mr. Niecks very much for the great profit and pleasure I have derived from his lecture, and I feel that when it is published we shall find it exceedingly useful. There are only one or two little things which struck me. He spoke about there being two parties with regard to the use of accidentals—those who favoured no accidentals before the notes at all, and those who wished some to be placed. I understood him to say that with those who did place them it was purely a matter of taste, and that there is no rule for it. Is that so?

Mr. Niecks.—I said it was purely a matter of taste, not a matter of history; that the matter could not be tested by historical facts.

Mr. Jacques.—I understood the chief rule they followed at that time was that the characteristic note of each mode was not to be interfered with; that was the point. For instance, in the mode beginning on D, it was necessary to have the major sixth, but you might have the seventh sharpened.

Mr. Niecks.—The major sixth is, as a rule, flattened whenever the sixth goes back to the fifth.

Mr. Jacques.—Is not that the Æolian mode?

Mr. Niecks.—Let us take the scale D, E, F, G, A, B. If the melody were to rise, say, from A, the fifth, to B, and then go back to A again, in that case the B would be flattened. But if the B were to rise and go on to C, then the B would remain natural. There seems to be no doubt about that, because all the theorists mention that particular point.

Mr. Jacques.—I think I first met with that theory in

Dr. Marx's "School of Composition," that the characteristic notes ought to be retained. I think he has given a whole table of them?

Mr. NIECKS.—Yes, that is quite correct.

Mr. JACQUES.—Then Mr. Niecks said he had no explanation to offer, and invited us to invent one, for the perplexing discrepancy in the placing of accidentals. May not that have been from a desire on the part of composers to conform, as they thought, to the mode? For instance, if we saw what we call D minor indicated by the note being flattened, was not the composer, perhaps, meaning to indicate the Dorian mode, what we call the first Gregorian tone? Is not that a possible explanation of the discrepancy that we find the same composer sometimes uses a flat in the D minor, and sometimes leaves it out?

Mr. NIECKS.—I do not think so. Our scales were already firmly established and fixed.

Mr. JACQUES.—I mean to suggest that they sometimes might have used our scale, the major or minor, and at other times they did not.

Mr. NIECKS.—I have often thought of that. But even if this theory should be found to hold good in the case of the minor scale, I do not see how it could be made to work with the major scale.

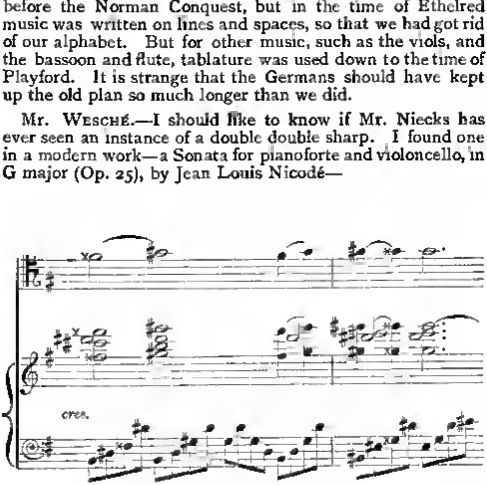
Mr. SOUTHGATE.—In the mention of *musica ficta*, about which there has been a great deal of discussion, it has always struck me that it is very doubtful whether there should be accidentals or not in the passages disputed over. There are two parties, one desiring that the accidentals should be used, and the other that they should be left out; we can hardly say whether they were required or not, and possibly there was no fixed practice. One cannot help noting that if from the chord of G minor you go to the chord of C, there is rather a desire to make the B flat (in the G minor chord) a B natural. Such is an example of questionable notation, difficult to settle in old music. We have examples of old music which has been reprinted, and you find theorists, and probably many of us, who doubt whether there should be certain accidentals in or whether there should not. Of course our ears have lost the old tonal feeling that the people who sang and wrote in those days had, and we are not well able to decide. It is certainly very much to be desired that these accidentals should be put in. With regard to the St. Andrew's cross sharp, I think it was used later than Mr. Niecks said. If my memory serves me rightly, in some of the earlier editions of Handel published by Walsh I think you will find that.

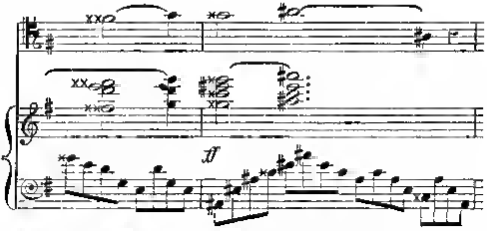
Mr. NIECKS.—Much later than that even.

Mr. SOUTHGATE.—That which interests me very much is

the old German Tablature. I lately had a very curious book in that tablature sent me from Berlin. It was an old book of organ music made for, or by, an organist of the name of Erasmus Hofer, and it had the date of 1601 at the end. The several pieces in it evidently consisted of the organ parts of Motets by Orlando Lasso, Vecchio, Rienero, and others, composed in four, five, six, seven, or eight parts, and all written in this curious tablature. I went to work to translate it, and found it a difficult task, but by perseverance and counting I found the key. One of the things which puzzled me more than anything else was that extraordinary method of indicating sharpened or flattened notes to which Mr. Niecks has called attention. It did seem a most extraordinary thing that the perfect fifth to A♭ should be D♯, and it puzzled me for a very long time; but at last I found that the Germans were not so perfect in their notation as we were, and that they were obliged to make one sign do for the E♭ and D♯, &c. It is very curious that that organ tablature should have lingered so very long in Germany. We had a tablature ourselves at a very early period, and we discarded it. There are some known examples of its being used as early as the time before the Norman Conquest, but in the time of Ethelred music was written on lines and spaces, so that we had got rid of our alphabet. But for other music, such as the viols, and the bassoon and flute, tablature was used down to the time of Playford. It is strange that the Germans should have kept up the old plan so much longer than we did.

Mr. Wesché.—I should like to know if Mr. Niecks has ever seen an instance of a double double sharp. I found one in a modern work—a Sonata for pianoforte and violoncello, in G major (Op. 25), by Jean Louis Nicodé—





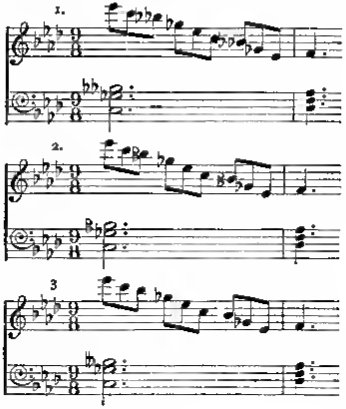
It is not really intended to raise the note two whole tones, but only a tone and a half.

THE CHAIRMAN.—I think we must certainly pass a vote of thanks to our lecturer of this evening for his very interesting paper.

[The vote of thanks was carried unanimously.]

A NEW SIGN FOR THE DOUBLE FLAT.

THE ASSISTANT SECRETARY.—In the discussion on Mr. Niecks's paper read in March, on "The Sharp, Flat, and Natural," reference was made to the absence of a single sign to indicate a double flat, such as is used in the case of a double sharp. I have been asked to bring under the notice of the members of this Association two signs with that object, which have been invented by Mr. Ross, of Messrs. Novello's printing establishment, through whose hands our "Proceedings" pass when in course of publication. A very great deal of music being now printed from type, it is found that the double sign at present in use occupies so much space as to interfere with the symmetrical appearance of the music when thus set up, and Mr. Ross was therefore led to devise some sign which should obviate this disadvantage. The two signs which he has produced achieve this object, and in presenting them to you for your opinion, Mr. Ross hopes that approval from distinguished authority may lead to the general adoption of one or other of them. It is, of course, desirable that any new sign, in order to gain ready acceptance, should present to the eye some resemblance to the present double flat, and thus suggest that the note must be lowered from its normal position. It will be noticed that both signs fulfil this requirement. The following passages show first of all the present double sign and then the two signs invented by Mr. Ross.



April 7 1890

CHARLES E. STEPHENS, Esq.,

In the Chair.

WHAT IS SOUND?
THE SUBSTANTIAL THEORY VERSUS THE WAVE THEORY OF ACOUSTICS.

By George Ashdown Audsley, F.R.I.B.A.

It is perhaps a rather startling question to put to the learned and accomplished members of such an Association as this—What is sound? All your lives long you have doubtless held very firm and clear convictions on the subject of Sound; and have trustingly accepted the theory which has obtained, one may almost say, since the time of Pythagoras, and which has, in our day, been fostered by all the great acousticians, and dogmatically taught by Professors Tyndall, in England, Helmholtz, in Germany, and Mayer, in America.

Until I put pen to paper and issued my "Review of the Old and New Theories of Sound" in the pages of the *English Mechanic and World of Science*, it is not too much to say that the existence of a modern theory of acoustics was all but unknown in Europe; it certainly was never openly submitted to the consideration of the English public. I am well aware that its existence has been known for some years to the three great acousticians I have named; and that they have been challenged to refute it, or, in face of it, to substantiate their beloved wave or "undulatory theory" of sound, shaken to its very roots by the results of modern thought and investigation. Notwithstanding this challenge by scientists as worthy of respect as themselves, they have neither admitted their knowledge of the modern theory in any public manner nor have they refuted it or done anything, in the face of its teaching, to fix their own theory on an unassailable basis. Nothing but a curious silence has been observed.

Does anyone present remember of ever having heard the professors under whom he has studied, or with whom he has come in contact during the last ten years, mention the fact that the truth of the wave theory was being seriously

questioned, or that it stood in the slightest danger of being completely shattered? I have never met with an individual who has answered that question in the affirmative.

Well, I have ventured to come before you to-day, just to tell you something about this new departure in acoustical science, and to briefly argue the case between it and the time-honoured and widely accepted Wave Theory of Sound. Let me ask, first of all, your kind and courteous hearing and attention, bearing in mind that such a discussion is nothing, and should be nothing, of a personal nature. I am going to consider simply a matter of science, as viewed under the obvious and natural phenomena of sound creation and propagation, and to endeavour to bring reason and common sense to bear on matters hitherto far too much dependent upon mathematical formula and misdirected and misconstrued experiments for their support.

To all musicians the subject is one of the deepest interest, and I can assure you all, that if the old wave theory, with all its mechanical impossibilities, is swept away, another will take its place of infinitely greater dignity and simplicity, for the musician will find his glorious art bound up with one of the great forces of nature, and in no way dependent upon a system of mechanically produced *sound-waves*, or a pulsatory motion of the air.

Let me say a few words by way of an apology for my appearing before you in the capacity of a speaker on the subject of acoustics. I am not altogether a stranger in this room, having had, during the last session, the pleasure of reading a Paper on matters connected with the Organ. Well, my apology is this: For twenty-five years I have studied matters relating to sound and its phenomena, and during that time have read all the leading text-books and treatises on the science of acoustics which seemed to throw any light on the subject of sound. Further than that, I have ventured to close those books and to think for myself—a very sinful thing to do in the eyes of dogmatic teachers—and occasionally have been rash enough, as some of my future remarks will show, to use the common sense the Creator has given me.

The result of this independent use of thought and common sense was a very strong doubt in the truth of the theory taught by our leading acousticians, and a very decided objection to their one-sided methods of conducting experiments in support of their views. How one-sided some of their experiments are, you shall have an opportunity of judging for yourselves. Whilst in the midst of the fog of doubt and uncertainty raised by the bad habit of using my own judgment, I heard of the new theory of acoustics founded by Dr. A. Wilford Hall, of America. I need not assure you that I lost no time in making myself acquainted with his

views, and testing to the fullest extent in my power the truth and reasonableness of the arguments advanced against the wave theory and in favour of his new hypothesis. Just as I had before, by the use of independent thought and common sense, doubted the truth of the wave theory, so did I now, by a similar process, accept the new or Substantial Theory of Sound as in all essentials reasonable, and compatible with the known and observed phenomena of sound. Subsequent study and careful investigation have convinced me that the wave theory is false and insufficient, and that Dr. Hall's theory is true.

This is the only apology I can offer for appearing before you on the present occasion, and for asking your kind and considerate attention to my following remarks. Whatever may be the fate of the theory I advocate, there is just one fact worthy of notice—namely, that you are listening to the *first Paper* on the substantial theory of acoustics ever read before a European audience.

I cannot help realising that I have undertaken a very venturesome task in essaying to prove, in one necessarily brief Paper, the falsity of the wave theory and the truth of the substantial theory of sound; and I need not assure you that I shall have to pass over much on both sides of the question which I should like to submit to your consideration, and which I am certain you would feel an interest in hearing and subsequently thinking out for yourselves. Perhaps, should my subject commend itself to your minds, I may be permitted at some future time to open it up more completely than it will be possible for me to do to-day.

It is advisable for the sake of some of my hearers, and it is necessary for my present purpose, that I should briefly outline the teaching of the wave or "undulatory theory," as presented in the writings of our greatest authorities, and this I now proceed to do.

I presume no one present will object to my taking Professor Tyndall as the most trustworthy exponent of the science of acoustics as commonly accepted and taught; and I can fancy your saying, not only that he is perfectly trustworthy, but that it is a piece of presumption on the part of anyone to call in question his teaching in the matter of sound. I shall have to do so, much to my regret, in a very decided manner and supported by proofs.

According to this great acoustician, "The sound of an explosion is propagated as a *wave or pulse through the air*. This *wave* impinging upon the tympanic membrane causes it to shiver, its tremors are transmitted through the drum to the auditory nerve, and along the auditory nerve to the brain, where it announces itself as sound.

"A sonorous wave consists of two parts, in one of which

the air is *condensed*, and in the other *rarefied*. The motion of the sonorous wave must not be confounded with the motion of the particles which at any moment form the wave. During the passage of the wave every particle concerned in its transmission makes only a small excursion to and fro. The length of this excursion is called the *amplitude* of the vibration."

From this statement it is obvious that the propagation of sound is solely a mechanical matter; whilst from the same teaching it might be argued that sound *per se* has no existence. We are apparently taught that what we know as *sound* is simply a sensation in the brain. We are distinctly told that what we realise as *sound* is caused by *waves* sent through the air by the purely mechanical action of a vibrating or exploding body, and by those waves striking upon our tympanic membrane and setting it into corresponding motion. Up to this point, however, and on this reading of Professor Tyndall's words, sound, as we know it, may be supposed to have no absolute existence; but when the vibrations so set up in the tympanic membrane are communicated to the auditory nerves, and by them conveyed to our brain, we instantly experience the sensation of sound. The definition of sound, as given by our leading acoustician, is certainly ambiguous; and one can almost sympathise with the American scientist, Professor Stahr, who, in criticising Dr. Hall's new theory, made the serious blunder of stating publicly in the columns of the *Reformed Quarterly Review* (July, 1883), that "sound is really a sensation, that is, the impression made through the ear and brain upon the mind."

Now it is quite certain that Professor Tyndall never intended to convey such an idea as this, for in doing so he would be laying an axe at the root of his favourite wave theory. This theory, as universally taught, says that sound is constituted of *air-waves*, each of which is formed of a condensation and a rarefaction of the air, not of a mental "impression" or "sensation" caused by such waves. As Dr. Hall, in replying to Professor Stahr's blundering attack, says: "We could quote a hundred passages from the highest authorities on acoustics to prove that (according to their wave theory) *sound* is that very *wave-motion* which travels through the air from the place of origin, or from the sounding instrument, to the ear and to the brain, where it terminates in producing the *sensation of hearing* as its effect. This *mental impression* is not *sound* at all, but is the final effect of sound upon the brain and mind. If it is ever called *sound* it is by a well-known trope called metonymy of speech, by which the effect is put for the cause. . . If sound is fundamentally but '*the impression made through*

the ear and brain upon the mind,' then that which produces such 'impression' by beating against the tympanic membrane and bending it 'in and out,' and which travels several miles from the sounding body through the air in the shape of 'condensations and rarefactions' as the wave theory teaches, is not sound at all."

Professor Tyndall says, in commenting on one of his illustrative experiments: "Thus, also, we send sound through the air, and shake the drum of a distant ear." He does not say, as Dr. Hall points out, "Thus do we send the *mental impression* through the air, and shake the drum of the distant ear, when the ear has first to be shaken, according to the wave theory, before the *mental impression* can exist!"

It is to be regretted that Professor Helmholtz is not much clearer in his language than our English scientist, for he says. "The motions proceeding from the sounding bodies are usually conducted to our ear by means of the atmosphere. The particles of air must also execute periodically recurrent vibrations, in order to excite the sensation of a musical tone in our ear. This is actually the case, although *in daily experience sound at first seems to be some agent, which is constantly advancing through the air and propagating itself further and further.*" It is a pity, for the sake of science, that this celebrated acoustician did not pay closer attention to the "daily experience" he acknowledges, for had he carried the thought that sound "seems to be some agent which is constantly advancing through the air" to its logical conclusion, little would, in all probability, have been left for Dr. Hall to do in connection with acoustical science, and his great work, "On the Sensations of Tone," as the scientific world knows it, would never have been written.

Professor Helmholtz, alluding to the "propagation of the sonorous tremor," and the "constant attraction of fresh particles into its sphere of tremor," says: "This is a peculiarity of all so-called *undulatory motions*. Suppose a stone to be thrown into a piece of calm water. Round the spot struck there forms a little ring of wave, which, advancing equally in all directions, expands to a constantly increasing circle. Corresponding to this ring of wave, sound also proceeds in the air from the excited point and advances in all directions as far as the limits of the mass of air extend. The process in the air is essentially identical with that on the surface of the water. The crests of the waves of water correspond in the waves of sound to spherical shells where the air is condensed, and the troughs to shells of rarefaction."

If time would permit I should like to follow Helmholtz through all his elaborate comparison between the behaviour of water-waves and sound-waves; but I must content myself by saying that after years of careful study of his teaching, I

most unhesitatingly affirm that no thorough or logical comparison can be instituted between the behaviour of *water-waves*, however generated, and the behaviour of *sound* as known to us by "daily experience."

Now, by the aid of a simple diagram I have prepared, I shall be able to convey to your minds some idea what sound-waves are supposed to be, according to the teaching of Professors Tyndall and Helmholtz.

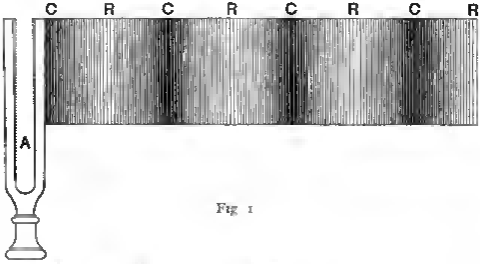


Fig. 1

The diagram, Fig. 1, shows a tuning-fork, A, such as one of the large Kœnig forks on the table, and its prongs are shown advancing—"swiftly advancing," according to the usual expression found in acoustical text-books; how swiftly it will be my duty to state presently—and extending from one of its prongs is delineated a broad shaded band, intended to convey a graphic idea of the *sound-waves* sent off by the mechanical action of the prong into the surrounding air. How does the tuning-fork produce sound? I shall endeavour to give you the rational explanation shortly; but, in the meantime, let me give you the wave theorist's version of the matter. We are told by Professor Tyndall, if we want to understand this question, and "to picture to ourselves the condition of the air through which this musical sound is passing," we must "imagine one of the prongs of the vibrating fork *swiftly advancing*; it compresses the air immediately in front of it, and when it retreats it leaves a partial vacuum behind, the process being repeated by every subsequent advance and retreat. The whole function," continues the Professor, "of the tuning-fork is to carve the air into these condensations and rarefactions, and they, as they are formed, propagate themselves in succession through the air. A condensation with its associated rarefaction constitutes a sonorous wave." According to this teaching, and it fortunately is perfectly explicit, the whole function of the tuning-fork, with its prong

"swiftly advancing," is to carve the air into condensations and rarefactions. In our diagram, the condensations are indicated by the darker shadings, at C, C, C, C, whilst the lighter portions, at R, R, R, R, represent the rarefactions. The sound-wave is measured from condensation to condensation—from C to C.

To give full weight to what I have to say on the tuning-fork, it is necessary for me to add here a few words by Professor Helmholtz on this important acoustical instrument. He says: "Take a pendulum, which we can at any time construct by attaching a weight to a thread and setting it in motion. The pendulum swings from right to left with a uniform motion uninterrupted by jerks. Near to either end of its path it moves slowly, and in the middle fast. Among sonorous bodies, which move in the same way, only very much faster, we may mention tuning-forks." Now I must ask you to remember the two expressions used by Professors Tyndall and Helmholtz in speaking of the purely mechanical action of the prong of a tuning-fork. One speaks of the prong "swiftly advancing," and the other speaks of its moving "very much faster" than a pendulum. Of course, these scientists well know that the prong of a tuning-fork must advance swiftly and must move very much faster than any pendulum ever constructed, before it can "compress the air immediately in front of it," and "carve the air into condensations and rarefactions," which will create *sound-waves* and send them off in all directions at the velocity of 1,120 feet a second to "shake the drum of a distant ear." But neither of these teachers gives us any idea of what he understands the speed of the vibrating prong to be, and this is just a slight omission, for it is an important matter, as I shall now attempt to show.

In the first place, let me point out to you the clear teaching of the wave theorist with reference to the action of the tuning-fork in producing sound—he distinctly implies, if he does not put it in hard words, that nothing issues from the vibrating steel itself, yet he calmly speaks of it as a "*sonorous body*" Would not it be more logical to call it simply a *vibrating body*, seeing that it has to do mechanical work in *condensing* and *rarefying* the air and sending off *air-waves* at the velocity of, say, 1,120 feet in a second, before what we know as sound is created? Now let us lay aside these views of others, and do a little calm thinking and testing for ourselves. Here is a tuning-fork yielding the note C of 256 vibrations a second. What does it teach the careful experimenter, the unprejudiced reasoner, and the student given to using his common sense? It teaches him that whilst it pours forth a beautiful sound, it is as incapable of condensing the air in front of it, and of sending off air-

waves about 4 feet 4 inches long, at the uniform velocity of 1,120 feet a second, as a morsel of fluttering gold leaf. This statement doubtless surprises you, but what I am now going to add will probably surprise you still more.

This fork when properly bowed will continue to pour forth audible sound for a little over four minutes. The sound, as you know, gradually decreases until it is inaudible to the ear, and this decrease of strength is in accordance with the uniformly diminishing swing of the fork's prongs.

The remarks I am now going to make on the fork's vibrations, are based on the experiments carefully conducted by Captain R. Kelso Carter, late Professor of Higher Mathematics at the Pennsylvania Military Academy. Captain Carter used a Kœnig fork precisely similar to the one on the table To one prong he attached a fine recording point, and then by drawing the fork whilst in vibration over a piece of smoked glass, he secured an accurate register of the swing of the prong during one minute, then, from a number of exceedingly careful measurements made with a powerful microscope, and by the aid of a micrometer showing the one roo,oooth of an inch, the following results were obtained :—

	Amplitude of Swing
After striking	$\frac{1}{8\,0}$ inch.
,, 15 seconds	$\frac{1}{1\,8\,0}$,,
,, 30 ,, ... about	$\frac{1}{3\,6\,0}$,,
,, 45 ,, ... ,,	$\frac{1}{4\,6\,0}$,,
,, 60 ,, ... ,,	$\frac{1}{5\,6\,0}$,,

The greatest care was used to strike the fork each time with the same force; and a number of trials were made, and the lines traced were patiently measured under the microscope.

Describing his experiments, this scientist remarks :— "Before closing the experiment I measured a number of traces made when the fork had been sounding for some time, and the vibrations were entirely invisible to the naked eye. The one I will here record was carefully measured under a powerful glass, which plainly showed the waves in the trace And let it be particularly noted that in this case the fork continued to sound audibly *after* marking the trace upon the glass, though much of its vibration was checked in making it. The amplitude measured was $\frac{1}{17\,0\,0\,0}$th of an inch, which is precise to at least $\frac{2}{1\,0\,0\,0}$."

Now, accepting this measured amplitude of the fork's prong whilst sounding audibly we find, as the prong vibrates 256 times in one second, that the entire distance travelled by it in one second is $\frac{256}{17\,0\,0\,0}$ths, or, say, $\frac{1}{6\,6}$th of an inch, or $\frac{10}{66}$ths of an inch in a minute of time.

From the general rate of decrease, which may be fairly

assumed from the measurements taken during the first minute of the fork's vibration, we may assume that the prong had been vibrating about two minutes when it recorded the complete swing of the $\frac{1}{17\frac{1}{600}}$th of an inch. Should we think it necessary to run the calculation down through the full four minutes which the Kœnig fork continues to send forth audible sound, we may reasonably assume that at the end of that time the fork prongs are swinging through a distance of about the $\frac{1}{1\,800\frac{1}{600}}$th of an inch, or about the $\frac{1}{18\frac{1}{600}}$th of an inch in a second of time.

It is quite unnecessary, however, to go one step beyond the measured swing of the $\frac{1}{17\frac{1}{600}}$th of an inch, for, surely, there can be found no one with common reasoning powers who will maintain that a fork-prong travelling at the rate of only $\frac{1}{18}$th of an inch in a second can carve the air into sound-waves, or air waves, formed of condensations and rarefactions; and that in moving at each swing the $\frac{1}{17\frac{1}{600}}$th part of an inch in the 256th part of a second can send off such waves, measuring about 4 feet 4 inches from condensation to condensation, at the uniform velocity of 1,120 feet in a second of time.

Now you will remember that Professor Tyndall, in speaking of the action of the tuning fork, says: we must "imagine one of the prongs of the vibrating fork swiftly advancing"; and then he asserts, "the whole function of the tuning fork is to carve the air" into sonorous waves, consisting of condensations and rarefactions. Can he, when he put these remarks in his well known text-book, have been aware of the almost infinitesimal motion of the prongs whilst still sending forth audible sound—motion absolutely incapable of disturbing the air even to the distance of one inch from the prong? Surely not; for had he been aware of the facts of the case he could never have used the words "swiftly advancing" with reference to a body moving almost too slowly to be realised by the mind.

Further, in speaking of the tuning-fork's motion, Professor Helmholtz tells us that its prongs move like a pendulum, "only very much faster." He, of course, realises that the fastest pendulum ever made could, under no possible conditions, be expected to carve the air into sound waves, simply because the air would refuse to be carved into condensations and rarefactions, and naturally elect to quietly flow round the moving body; and he also realises that if the pendular motion of the tuning fork is to produce sound-waves, &c., it must move "very much faster" than the fastest pendulum ever set wagging by the hand of man. His great and unpardonable mistake lies in his not condescending to inform his readers and the scientific world generally just how much faster the sound-producing fork must move than the fastest known pendulum. You can, however, arrive at a

fair conclusion for yourselves in this important matter—make a pendulum with a weight and thread, and time its swings after measuring them. Then compare the results with the facts I have given you with reference to the vibrations of the tuning-fork. You will most certainly find that the latter are very much slower, and not, as Helmholtz affirms, "very much faster" than the motion of the pendulum. Professor Tyndall remarks—"When a common pendulum oscillates, it tends to form a condensation in front and a rarefaction behind. But it is only *a tendency;* the motion is *so slow* that the highly elastic air moves away in front before it is sensibly condensed, and fills the space behind before it can become sensibly dilated. Hence sonorous waves or pulses are not generated by the pendulum. It requires a certain sharpness of shock to produce the condensation and rarefaction which constitute a wave of sound in air." Now, are we expected to believe that a small tuning-fork prong, which oscillates the $\frac{1}{800}$th, the $\frac{1}{17\,000}$th, or the $\frac{1}{4\,000\,000}$th of an inch, can generate sound by condensing and rarefying this elastic air which defies the large swings of a pendulum? I, for one, refuse to believe any such nonsense.

I have in the foregoing remarks endeavoured to show you the simple truth about the vibratory motions of the tuning-fork whilst it is producing audible sound; and, further, to impress you with the fact that its motions are far too minute to exercise any effect on the surrounding air, even to the distance of an inch from its prongs. All this upsets the theory that the sound we hear from the vibrating fork is constituted of sound waves, as taught in our text-books; but it does not prevent our hearing the sound the fork is sending forth; nor does it directly inform us how or why the fork sounds, or what constitutes sound *per se*.

Before proceeding to the consideration of certain phenomena of sound, upon which the undulatory theory of acoustics is built up, I think it desirable to submit for your consideration the Substantial Theory, the claims of which I urge on the present occasion. I must do this very briefly, and, unfortunately, I must leave many important matters connected with it untouched upon in a necessarily short Paper like this. I shall first give you the definition of sound according to the new theory, and then quote a few words from the writings of the founder of the theory, with reference to the subject.

Sound is one of the primordial forces of nature; it is a substantial force, or an immaterial objective entity, governed by laws ordained and fixed immutably by the great Architect of the Universe. This form of force can only be generated or liberated from the force-element of nature by one means devised for that end—namely, vibration of the sonorous body itself.

Such is, briefly, what I believe sound to be; and I accept the definition as reasonable, perfectly consistent with all the observed phenomena of sound, and with "daily experience." You will remember the words of Professor Helmholtz, who says, although he accepts the time-honoured wave theory: "In daily experience, sound at first seems to be some agent, which is constantly advancing through the air and propagating itself further and further." How nearly this great scientist's "daily experience" had wafted his scientific reason into the haven of truth; but the waves, with their condensations and rarefactions, carried the frail and rudderless bark out into the stormy sea of false science.

Now let me somewhat enlarge upon the definition just given.

When any sonorous body is set into vibration, sound-pulses or pulses of substantial force element are released and sent off from it. Such pulses are generated by the interaction of forces in the sonorous body, and depend on the sonorous properties of the body. In certain bodies the force stored up in them by the mechanical action of setting them into the required state of vibration, is partly converted into heat and partly into sound-pulses: and the difference between the quantities of these two forces constitutes the difference of sonorous property in any vibrating body. The cohesive force and other forces present in the body control the action of the mechanical force exercised, converting some of such force into heat, and some into sound-pulses. To aid you in grasping what I have affirmed, I may remark that the pulses of substantial, but immaterial sound force, are analogous to electric discharges. Several of the common phenomena of sound fully support this hypothesis.

I shall now turn to the writings of the founder of the substantial theory, and briefly direct your attention to the reasoning which led him to reject the wave theory as false and untenable.

The Substantial Philosophy teaches and lays down as its "central and cardinal proposition," says Dr. Hall, "that every force of nature, as a *phenomena-producing cause*, must, in the very necessities of true science and of the relations of cause and effect, be a substantial entity or an objective existence."

Dr. Hall assures us that he found himself confronted, at the outset, with difficulties in essaying to reconcile such a radical assumption with the existing theories of science which teach that some of the most conspicuous natural forces, and the causes of observed phenomena, are the *mere motions of material particles*. He says: "To have admitted for a single moment the assumed basic facts of the current motion-theories of science—namely, that the forces

of sound, heat, and light were but the motions of matter, and that there was nothing substantial about them as phenomena-producing causes, would have been to abandon the entire Philosophy of Substantialism which, from the very start, we had mapped out as of universal application.

"To concede to science as at present taught the truth of the position that any force could be but the *motion* of material particles such as air or ether, would be to make force an *effect* and not a *cause*. Surely no one is so superficial, after his attention has been called distinctly to the subject, as not to see that the motion of matter, which is intrinsically inert, can only be the *effect* of some applied force which is its moving *cause*.

"To suppose force of any kind to be the motion of matter, and at the same time to be the cause of such motion, was to our mind an absurdity, though it glared at us from every page of our physical text-books; and it was no easy task to invent or discover a system of natural philosophy or scientific reasoning which would harmonise such inconsistency and thus bring order out of confusion. For plainly, as the motion-theories of science had presented the subject of force, the whole question seemed to us but a jumble of incoherent and self contradictory statements.

"To assume force of every kind or character to be a *substantial cause*, and the motion of matter under all possible circumstances to be its *effect*, seemed at once the entering wedge for the solution of the whole mystery. But how was it possible to regard the physical forces as substantial entities or objective things, especially the force of sound which produces the sensation of hearing? This was the serious obstacle which met us at the very start. We saw but little difficulty in assuming magnetism and electricity, for example, to be substantial or objective things, since it was self-evident that the physical effects produced by these forms of natural force, such as the displacing and lifting of ponderable bodies, could by no possibility be accomplished except by some real substantial cause. To suppose otherwise, as we reasoned, would be at once to fly into the face of all philosophy and even of common sense.

"But at this point a concomitant difficulty struck us. If these forces are substantial, and at the same time penetrate, pervade, and occupy other bodies at the same time and without any displacement of their material particles, as is the case with magnetism, how about the supposed law of the impenetrability of matter, or the impossibility of the double occupancy of the same space by two material bodies at the same time?

Of course, this had to be met and reconciled with our new

departure, or good-bye to Substantialism. But the task of unlocking this scientific door was easy with the key already discovered and in our possession. Universal substance, we assumed in the very rationality of entitative existence, must involve *immaterial* as well as *material* substances. Hence the idea of that grand classification was for the first time sprung upon the world—namely, of making two departments of the existing entities of the universe by dividing them into material and immaterial substances—placing all tangible and ponderable objects in the first division, and all the forces of nature in the second.

"This fortunate thought, though somewhat difficult to grasp at first, soon brushed aside that whole difficulty involved in the idea of two actual substantial bodies occupying the same space at the same time, since now the most impervious steel can be wholly occupied, pervaded, and penetrated by the *substantial* forces of heat, magnetism, electricity, gravity, cohesion, and sound in every part and particle of the matter composing it, and at the same instant of time."

As I have already stated, Sound is, according to the teaching of the Substantial Philosophy, a force of nature—*that form of force by which the sense of hearing possessed by men and animals is addressed and affected.* Such is sound in its true and primary sense—an external and substantial force, or *objective cause*; but in common language it has a secondary meaning—namely, the *sensation* in our consciousness, which is more correctly called *hearing*—an internal sensation or *subjective effect*. Thus by a trope, which is designated metonymy, we have the *effect* put for the *cause*. It will be well to bear these facts always in view, and so avoid confusion of ideas. In all cases the true and infigurative signification should be intended in using the word sound, when one is discussing matters connected with music, or the science of acoustics.

Let me now briefly consider how far sound, according to the definition given, bears the test of reasonable and logical comparison with the other forces of nature, which immediately address and affect the animal consciousness. *Sound* is that force in nature having definite laws of production and propagation, which by entering our ears, or coming in contact by any other means with our auditory nerves, produces in our consciousness the sensation of *hearing*. *Light* is that force in nature having definite laws of production and propagation which, by entering our eyes and coming in contact with our optic nerves, produces in our consciousness the sensation of *seeing* or *sight*. *Heat* is that force in nature having its own laws, which, by affecting any portion of our system of tactile nerves, produces in our consciousness the sensation of *warmth*.

Odour is that force in nature which by entering our nostrils and coming in contact with our olfactory nerves, produces in our consciousness the sensation of *smelling* or *smell*. And *flavour* is that force which, coming in contact with our system of gustatory nerves, produces in our consciousness the sensation of *taste*.

It will at once be realised that in removing sound from its time-honoured place as a purely *mechanical effect* (for no logical reasoning on the part of the wave theorist can, under the mechanical or undulatory theory, place sound or sound-waves as a *cause*), and placing it in the dignified position amongst the primordial forces of nature, we reconcile it at once with all the other forces which more immediately address and affect our animal consciousness, as well as with those greater forces which we call cohesion, gravity, magnetism, and electricity. In such dignified position is it not infinitely more worthy of the musician's love and respect, and when viewed as a force direct from the hand of the Creator, does it not account for much which has hitherto been most mysterious in the power of music? Think of it, oh ye musicians!

I feel I have said very little on this great subject, and that little very badly; but I must now leave argument in words for argument in experimental demonstration. Time will, however, only permit of a few experiments, and that in the direction of showing you upon what very shallow arguments and wrong conclusions the wave theory of acoustics has been supported by its greatest advocates. As I pass on you will see how perfectly the theory of *substantial sound force* accounts for each and every phenomenon.

By way of an introduction to my first experimental demonstration of the nature of sound, let me direct your attention to the different teaching of the old and new theories of sound.

According to the wave theory we are taught that sound-waves, mechanically generated by the vibrating or exploding body, are capable of mechanically moving, shaking, or breaking other bodies against which they strike; whilst, according to the substantial force theory, we are assured that sound force, however great its volume may be, is absolutely incapable of moving a cobweb, or any body whatever which is not in vibrational sympathy with that sound force. Or, as Dr. Hall puts it: "The differences between theoretic air-waves, according to the current theory, and pulses of sound force according to Substantialism, is this: the air-waves are supposed to be purely mechanical in their operation, striking any and all objects in their way with the same force according to resisting surface. On the contrary, pulses of sound force are supposed to act on no material object that

is not in vibrational sympathy with them, any more than substantial rays of magnetism will act on a piece of wood or other body not in magnetic sympathy. There is no more necessity of assuming air-waves to be sent off from the vibrating instrument to beat against the tensioned string, diaphragm, or flame, to cause its motion, than there is of assuming that the magnetism which lifts the distant iron bar does it through some action exerted upon it by the connecting atmosphere. If the immaterial but substantial force of magnetism can produce physical displacement of a ponderable body at a distance, why cannot substantial but immaterial sound force do the same under a different law of nature?"

Now for our first experiment.

If you turn to the opening pages of the leading English text-book on acoustics, Professor Tyndall's "Sound," you will find, in the paragraphs devoted to the "Confinement of sound-waves in tubes," a very remarkable experiment described—the experiment I am now about to show you, just as Professor Tyndall performed it in the Royal Institution before a scientific audience, and then as I think it ought to be completed so as to get out its full teaching. Professor Tyndall thus clearly describes his remarkable experiment: "The weakening of sound, according to the law of inverse squares, would not take place if the *sound-wave* were so confined as to prevent its lateral diffusion. By sending it through a tube with a smooth interior surface we accomplish this, and the wave thus confined may be transmitted to great distances with very little diminution of intensity. Into one end of a tin tube, fifteen feet long, I whisper in a manner quite inaudible to the people nearest to me, but a listener at the other end hears me distinctly. If a watch be placed at one end of the tube, a person at the other end hears the ticks, though nobody else does. At the distant end of the tube is now placed a lighted candle. When the hands are clapped at this end, the flame instantly ducks down at the other. It is not quite extinguished, but it is forcibly depressed. When two books are clapped together, the candle is blown out. You may," continues the Professor, "here observe, in a rough way, the speed with which the *sound-wave* is propagated. The instant the clap is heard the flame is extinguished. I do not say that the time required by the *sound* to travel through this tube is immeasurably short, but simply that the interval is too short for you to appreciate it. That it is a *pulse*, and not a *puff* of air, is proved by filling one end of the tube with the smoke of brown paper. On clapping the books together no trace of this smoke is ejected from the other end. The pulse," concludes the Professor, "has passed through both smoke and air without carrying either of them along with it."

Now, I have no wish to be disrespectful, but I cannot help asking the simple question—if any sane man can accept Professor Tyndall's experiment as a proof of the wave theory of sound, or believe his explanation of the whole matter?

I shall now perform the experiment before you exactly as Professor Tyndall performed it before his audience in the Royal Institution, in direct support of his favourite theory of sound; and then I shall conduct it as I think it ought to have been performed on that occasion, but was not, probably because its results would in no way have supported the wave theory.

Here is a tube similar in form to that used by Professor Tyndall, but much shorter. I prefer to use a short tube because the tests I subject the whole question to are very much more severe and conclusive with it than with a 15-foot tube. I place a lighted candle, with its flame immediately opposite the smaller orifice, and on clapping my hands at the other end the flame instantly "ducks down." Now, on clapping two books together the candle is blown out. Such were the results obtained by Prof. Tyndall; but is there a single person present on this occasion who believes for one instant that *sound* had anything whatever to do with either the disturbance or the extinction of the flame? Surely not. Yet Professor Tyndall assured those who witnessed the similar experiment in the Royal Institution that both effects were caused by a *sound-wave*—"a pulse, and not a puff of air." We cannot help thinking that the distinguished lecturer paid a very poor compliment to the common sense of his hearers, whilst he taxed their gullibility to the utmost. I need not waste time with the part of the original experiment which ended in smoke, but may pass on to my version of the experiment.

I relight the candle and place it, as before, opposite the small, conical end of the tube; and on the flame becoming perfectly still, I proceed to test the effect, not of simply disturbed air as in the previous case, but of powerful and true *sound force* upon it. I now take this horn, which is capable of yielding very loud and sudden sounds—much louder than any that can be produced by clapping books together—and placing its bell directly opposite the larger end of the tube, I produce several varieties of sounds, loud and soft, short and sustained, yet to none of these does the candle flame "duck down" or show the slighest disturbance. Here, notwithstanding that the air at the bell of the horn is necessarily disturbed by that blown into the instrument from my mouth, we have no sudden concussion, no puff of wind, as in Professor Tyndall's *sound-wave* version of the experiment, but simply *sound* pure and simple; and this *sound*, or *sound force*, passes through the short tube and through the

flame without finding anything in sympathy with it, and accordingly, without disturbing anything. Now what can the wave theorist say regarding Professor Tyndall's original experiment and my extension of it? Is it not self-evident that if the former supports the *wave theory* with its mechanically set up air waves, the latter hopelessly refutes that theory? But even Professor Tyndall's experiment goes in no way to support his theory, simply because it was a sudden gust or puff of compressed wind which literally blew the candle out, and not sound of any kind. Anyone with a grain of common sense can see this, and it seems absurd insisting on the fact.

I have here a more perfect piece of apparatus, devised by myself, for the purpose of proving, in the first place, that vibrating sonorous bodies, while sending forth sound, do not disturb the air to any appreciable distance from their surfaces, and, in the second place, that the sound they send forth is incapable of moving or in any way affecting the lightest substances, or any substances or bodies whatever, which are not in perfect sympathy with the source of the sound.

The tuning-fork has been selected as the sound-producing body, because it is the favourite instrument in the hands of the acoustician for proving the existence of sound-waves, and for illustrating the mechanical action of those waves, as I shall show when I come to speak of sympathetic vibration and interference of sound. The remaining portion of the apparatus consists of a wooden tube, open at both ends, and furnished with small glass windows in the centre of its sides. Suspended within and between these windows is a strip of gold-leaf, almost filling up the air-way of the tube. The tube has a long slot cut in its lower side so that it can be moved over the prongs of the vibrating fork, or, what is more convenient, the fork can be moved, after being bowed, into the tube. Allowing the gold-leaf to hang perfectly still, I set the large fork into full vibration, and then push it into the tube until one of its prongs is quite close to the gold-leaf screen. If we are careful not to disturb the air we shall fail to observe the slightest flutter or movement of the leaf. Why is this? The wave theorist is bound to maintain that all the while sound-waves are being generated by the vibrating prong, and that they are sent off, with condensations and rarefactions, 4 feet 4 inches long, at the uniform rate of 256 in each second of time, and at the velocity of about 1,120 feet a second. The puzzle is how these waves—potent enough, in Professor Tyndall's estimation, to blow out a candle—manage to pass directly through the sensitive gold leaf screen without moving it. Here I might say, in the language of our greatest poet, "I pause for a reply."

As we are taught by the undulatory theory of acoustics that the sensation of hearing is caused by sound-waves or mechanically set up air-waves striking against the tympanic membranes of our ears and bending them in and out, it is highly desirable that we should, at this point, consider this important question connected with our sense of hearing, and strive to arrive at something like a true and logical conclusion anent the office and action of the ear.

The function of the ear is thus described by Professor A. M. Mayer, America's greatest wave theorist. He says: "Sound is the sensation peculiar to the ear. This sensation is caused by rapidly succeeding to-and fro motions of the air which touches the outside surface of the drum-skin of the ear. These to-and-fro motions may be given to the air by a distant body, like a string of a violin." After briefly describing the structure of the ear, the Professor continues: "Let us consider how this wonderful little instrument acts when sonorous vibrations reach it. Imagine the violin string vibrating 500 times in one second. The sounding-board also makes 500 vibrations in a second. The air touching the violin is set trembling with 500 tremors a second, and these tremors speed with a velocity of 1,100 feet in a second in all directions through the surrounding air. They soon reach the drum-skin of the ear. The latter, being elastic, moves in and out with the air which touches it. Then this membrane, in its turn, pushes and pulls the little ear-bones 500 times in a second. The last bone, the little stirrup, finally receives the vibrations sent from the violin string, and sends them into the fluid of the inner ear, where they shake the fibres of the auditory nerve 500 times in a second. These tremors of the nerve—how we know not—so affect the brain that we have the sensation which we call sound." We are further assured by this eminent scientist that the description "just given is not that of a picture created by the imagination." We shall see!

I feel that it is somewhat rash on my part to enter on so complex a subject in this short Paper, for it would require at least a full Lecture to do it justice. It is, however, quite necessary that it should be touched upon on the present occasion for the better understanding of my arguments.

It is probable that the illustration given by Professor Mayer may not at first strike one as containing any element of impossibility or absurdity, and if the tympanic membrane was merely taxed to vibrate with one uniform motion, at one uniform rapidity, and to transmit only one sensation or impression to the auditory nerve and brain at one time, we might, perhaps, pause before boldly questioning the truth of the whole matter. But let us think for a moment of what the tympanic membrane is called upon to do in accordance

with the imperative demands on the wave theory of sound, and our reason at once starts up in open revolt at the mechanical impossibility it is asked to recognise as fact. Have you, musicians, in listening to a grand Symphony, performed by an orchestra of a hundred instrumentalists, tried, whilst you heard the united harmonies of all, and whilst you easily followed the sounds of each class of instrument engaged, to realise what your tympanic membranes were called upon to do according to the popular scientific hypothesis? If not, do so, and let your reason and common sense lead you to a true conclusion.

As I have given you the views of one great American scientist on tympanic vibration as caused by a single violin string vibrating 500 times in a second, let me now, in preference to any imperfect words of my own, give you the views of another American authority, Professor G. R. Hand, on the other aspect of tympanic vibration. "Substantialism is thundering at the gates of Popular Science, and demanding a re-examination of the facts and proofs of the undulatory theory of sound. Tympanic vibration opens the portals of her secret chambers and extends a cordial welcome to her auditorium. We enter for a few moments, and take hasty cognizance of the beauties and inconsistencies that press themselves upon our consideration, as the ear-drum labours with herculean efforts to convey intelligent sounds to the auditory nerve, according to the popular theory. Now hold your breath, and pause, and look, and listen, as you mentally interrogate Dame Nature at every point.

"You see the little drum-skin posted at the vestibule to introduce the visitors into the *sanctum sanctorum*. It is required to bend its flexibilities and complacently how each visitor into the audience-room, though they come thick and fast as hail upon the unprotected window. Hark! The solemn notes from the lowest audible pitch of organ-pipe gravely demand admittance, and the muscular elasticity of our little sentinel is taxed to its minimum capacity to admit the troopers, with a genuflection or audiflection for each sound-pulse at the rate of not less than sixteen per second.

"Simultaneous with these, a troop more numerous, and more active and persistent, demand an audience, as notes of a higher pitch, borne upon miniature sound pulses, demand an introduction. Our little sentinel is now compelled to fly around and bow say 440 times in a second, whilst these are entering. You say this requires activity! Yes, it does. But remember, that while bowing 440 times per second, he is at the same time bending at the rate of sixteen times per second. But this is not all. The sounds of a full orchestra strike upon the ear at the same time, and the notes of various pitch, running through several octaves, are distinctly, audibly heard

in beautiful harmony; but every note requires a different rate of vibration, and yet all at the same time, until perhaps a score of different rates of vibration are manipulated at the same time.

"Now we begin to feel a kind of melancholy sympathy for our little sentinel, who is compelled to practise upon possible impossibilities, in the vain attempt to stretch, and contract, and bend, and perform hundreds of gyrations per second, and at scores of different rates of velocity all at the same time. . . . But the wave theory of sound compels submission to these absurdities and impossibilities, and while that bears sway our little sentinel must continue in this abject slavery.

"It is not out of order to question the right of assumption, or the authority of sending out these vocal and instrumental emanations in cavalry squadrons, mounted upon atmospheric waves or sound-pulses, to besiege our auricular organs in such a barbarous mode of attack. Almost any other member of the body would go to pieces or paralyze under the pressure of the unequal struggle against such an incessant and multitudinous bombardment.

"Thousands are assembled in a large hall. Hundreds of instruments of various kinds are playing in full orchestra. Thousands of voices are filling the air with all the notes within the compass of the human voice. We put on our philosophic glasses and see the sound-waves in endless variety emanating from these thousands of sonorous sources in all directions, from every centre, at different amplitudes and wave-lengths, meeting each other, crossing each other, at right angles, acute angles, obtuse angles, horizontally, vertically, and obliquely, impinging upon each other, dashing, surging, retreating, by impulse and reaction like a thousand wild animals turned loose in a menagerie, and yet amidst all this jarring and confusion each storm-tossed wave going with accuracy and unerring certainty, unchanged and pure, straight from its source to every point where an ear might be, and unloading its sonorous cargo all in good condition." The Professor concludes by saying: "If science desires to rejoice in unexceptional garments, she had better look to her wardrobe and repair these rents, or else replace her tattered duds with more reliable and scientific vestments."

Speaking of the musical sounds, the voices of men and women, the noises of rustling garments, gliding feet, clinking glasses, and so on, which fill a ball-room, and which "give rise to systems of waves, which dart through the mass of air in the room, are reflected from its walls, return, strike the opposite wall, are again reflected, and so on until they die out," Professor Helmholtz remarks: "And yet as the ear is able to distinguish all the separate constituent parts of this confused whole, we are forced to conclude that all these

different systems of wave co-exist in the mass of air, and leave one another mutually undisturbed. But how is it possible for them to co-exist, since every individual train of waves has at any particular point in the mass of air its own particular degree of condensation and rarefaction, which determines the velocity of the particles of air to this side or that? It is evident," says Helmholtz, without hesitation, "that at each point in the mass of air, at each instant of time, there can be only one single degree of condensation, and that the particles of air can be moving with only one single determinate kind of motion, having only one determinate amount of velocity, and passing in only one single determinate direction."

I may assure Professor Helmholtz that, on mechanical grounds alone, any other condition of things would be impossible, and we have only to imagine the point spoken of to be the tympanic membrane to see at one glance the absolute breakdown of the wave theory.

Professor Tyndall says: "The same air is competent to accept and transmit the vibrations of a thousand instruments at the same time. When we try to visualise the motion of that air—to present to the eye of the mind the battling of the pulses direct and reverberated—the imagination retires baffled from the attempt. Still, amid all the complexity, every particle of air is animated by a resultant motion, which is the algebraic sum of all the individual motions imparted to it. And the most wonderful thing of all is, that the human ear, though acted on only by a cylinder of that air, which does not exceed the thickness of a quill, can detect the components of that motion, and, by an act of attention, can even isolate from the aerial entanglement any particular sound." It is somewhat difficult to reconcile the teachings of these two eminent scientists, and I certainly have no time to attempt the task. A very few words must now suffice to dispose of the ear question.

It can be gathered from what I have just quoted and said, that to produce in our sensorium the sensation of hearing there must be external air-waves capable of setting up a mechanical action of a corresponding nature in the tympanic membrane of our ear. Under the wave theory, therefore, such air-waves must be capable of exerting some measurable force. On this subject I ask the wave theorist this first question: Can he measure the force of an air-wave sent off by the tuning-fork's prong whilst vibrating the $\frac{1}{17\,000}$th of an inch at each full swing, or, say, the large distance of $\frac{1}{50}$th of an inch in a second of time? And, further, I ask him if he can honestly believe that the drum-skin of his ear, the chain of bones behind it, and, lastly, the entire apparatus of the inner ear, is made to vibrate in and out 256 times in a second

by the sound waves from a fork vibrating $\frac{1}{1000}$ths of an inch in that time? Should he answer in the affirmative I can only recommend him to study mechanics

From what has been said you will no doubt have been impressed with the more than marvellous delicacy and sensitiveness of the tympanic membrane of the human ear; for to do what the wave theory calls upon it to do—namely, to move to-and-fro in a hundred different degrees of velocity at the same instant of time, and, by so doing, to convey a hundred different sensations to the brain at the same instant of time—it needs must be endowed with more than marvellous delicacy and sensitiveness. But are you and the wave theorists prepared to learn that, instead of being a tightly stretched, fine, and exquisitely delicate skin or membrane, the so-called drum-skin of the ear is not a tensioned diaphragm at all, but a loose or flaccid mass of tissue, incapable of receiving or transmitting any sound-wave vibrations whatever, and that it has quite a different office to perform in the animal economy? Such, however, is affirmed to be the fact.

The drum-skin or tympanic membrane is essential to the very existence of the wave theory, for it is against its exterior surface the sound-waves, with their condensations and rarefactions, strike, and surge, and battle, so that a report of their good behaviour may be instantly conveyed to the brain. No wave theorist can afford to do without this membrane in the ear, for with its non-existence the wave theory would become a joke in science.

The next important question is this: Is the tympanic membrane necessary to our hearing? The following extract from the first volume of "Dunglison's Physiology," giving a report of a case examined by the celebrated Sir Astley Cooper, will be a sufficient and appropriate answer:—

"Sir Astley Cooper was consulted by a gentleman who had been attacked by an inflammation of his left ear, which continued for several weeks. After twelve months, the same symptoms occurred in the right ear; in consequence of these attacks he became deaf, and remained so for several months. The hearing began to return, and, in about ten months from the last attack he was restored to the state he was in when Sir Astley examined him. Having filled his mouth with air, he closed his nostrils and contracted his cheeks, the air thus compressed was heard to rush through the *meatus-auditorius* with a whistling noise, and the hair hanging from the temples became agitated by the current of air that issued from the ear; when a candle was applied the flame was agitated in a similar manner. Sir Astley passed a probe into *each* ear, and thought the membrane of the left side *totally* destroyed, as the probe struck against the petrous portion of the

temporal bone. The space usually occupied by the membrana tympani was found to be *an opening* or aperture without one trace remaining. On the other or right side also a probe could be passed into the cavity of the tympanum, through an opening one quarter of an inch in diameter in the centre of the tympanic membrane. Yet this gentleman was not only capable of hearing everything that was said in company, but was nicely susceptible of musical tones, he played the flute, and had frequently borne a part in concerts, and he sang with much taste and perfectly in tune."

Commenting on these facts, Dr. D. A. Post asks: "If the wave theory of sound is true, how could Sir Astley's patient hear so perfectly? Is not the *vibration* of the tympanic membrane as essential to that hypothesis as the *sonorous wave itself*? As both membranes in this case were undoubtedly destroyed will some *undulatory* gentleman account for the sensation of sound in this man?"

I shall leave the careful consideration of these questions to those amongst you who care to arrive at the truth in matters of sound, and need only sum up the conclusions I have come to after long study and thought, thus—The tympanic membrane has never been intended to vibrate or adapted for vibration by means of sound; it is, in fact, not a delicate stretched membrane at all; it is simply a flaccid mass of tendinous fibre designed to protect the sensitive inner organs of hearing from the injurious effects of sudden and very loud sounds, and from foreign matter which might find its way into the ear. In addition to this, it is probable that this screen, which is called the tympanic membrane, may be designed to distribute sound force and so render it more effective. We have no authority, however, for this last supposition, and, accordingly, lay no stress upon it.

It is quite evident that the truth of the wave theory depends upon the existence of a sensitive, vibrating drum-skin in the ear, for what comes of *air-waves* or *sound-waves*, with their condensations and rarefactions, if there is no such sensitive vibrating membrane? And what is to be said when we realise the fact that we can hear when both our drum-skins are destroyed? Let some wave theorist answer.

The wave theorist has still another rather remarkable fact to face and account for. It is well known that persons who are deaf to all sounds through their ears, can hear, to some considerable extent, through the bones of the head. In a lecture delivered by Sir William Thomson, at Birmingham, in 1883, we find this passage: "Hearing is perceiving something with the ear. What is it we perceive with the ear? *It is something we can also perceive without the ear;* something that the greatest master of sound, in the poetic and artistic sense of the word, at all events, that ever lived,

Beethoven, for a great part of his life could not perceive with his ear at all. He was deaf for a great part of his life, and during that period were composed some of his grandest musical compositions, and without the possibility of his hearing them by ear himself; for his hearing by ear was gone from him for ever. But he used to stand with a stick pressed against the piano and touching his teeth, and thus he could hear the sounds that he called forth from his instrument."

With all these facts before us, I think you will admit that the science of acoustics, as at present taught, calls loudly for reconsideration and much unprejudiced discussion. If it is true, its supporters need neither fear one nor the other, for the more truth is investigated the brighter it shines.

I must now touch, but very briefly, on the phenomenon of sound known as *sympathetic vibration*. If time permitted I should have been glad to have enlarged on this subject and to have performed some experiments with stretched strings, but, as matters stand, I must content myself with the single illustration of the sympathetic vibration of the tuning-forks.

Sympathetic vibration has always been held as a strong argument in favour of the existence of both air-waves and sound-waves, but I fail completely in discovering one connecting link between such vibration and mechanical sound-waves. The wave theory teaches that, in the case of the sympathetic forks, the sound-waves sent off by the fork which has been bowed or otherwise set into vibration pass through the air and, impinging on the motionless steel prongs of the other and, perhaps, distant fork, set them into corresponding vibration. The action is purely a mechanical one, for we are assured that the silent fork is set in motion by reiterated blows or pushes of the sound-waves. Such an idea is so contrary to reason and fact that I have to exercise some patience in speaking on the subject. You have already heard enough about the microscopic vibrations of the tuning-fork's prongs to satisfy your minds that no such mechanical action as air-waves, with condensations and rarefactions of the air, can possibly be set up by them; and my gold-leaf experiment has incontestibly proved that the vibrating fork does in no degree disturb even a confined column of air at the distance of one inch from its prongs. Under these circumstances, therefore, it is quite evident that sympathetic vibration must be due to some other force than these impotent and non-existent air or sound-waves, and this force is the *sound force* of the Substantial Theory of Acoustics as already explained. Now for just one experiment.

I have here two forks in perfect unison, and I shall be glad if any gentleman present will carry one to the extreme end of the room, and, holding it in his hand, satisfy himself that it is

absolutely silent. Let the fork be held so as to touch nothing and be free to vibrate. I now bow the remaining fork before you, and then I instantly damp it. My fork is silent; but that held in the hands of the gentleman at the far end of the room is now sounding quite audibly to his ears, and to yours also if you will hold the opening of the resonant case to your ears.

Will any wave theorist affirm that this effect has been produced by vibrations in the form of air-waves generated and sent off by the fork I bowed? Surely not! Look at the solid steel prongs of the fork, which weighs fifteen ounces—bear in mind the fact that the prongs of the bowed fork only moved about the $\frac{1}{10}$th of an inch in each complete swing at the most—and then look at the distance and the many obstructions between the two forks. Does it not now strike you that there is some hitherto unknown and unrealised *force* in *sound*—a *force* akin to the other forces of nature, such as electricity and magnetism? At all events, do not throw the idea aside as unworthy of your calm consideration and earnest investigation.

I am of opinion that sympathetic vibration or sympathetic generation of sound form one of the most remarkable and noteworthy phenomena of acoustics; and as there can be no question of the great importance of sympathetic vibration as a teacher and as a guide to a right understanding of the nature of sound, it is strange, to say the least of it, that so little stress is laid upon it in our text-books on the science of acoustics. For instance, in Professor Tyndall's "Sound," only about two and a half pages are devoted to the discussion of "sympathetic vibrations." I have observed in all text-books on acoustics that there is a studied avoidance of all matters that seem to favour any hypothesis rather than the accepted undulatory one, and I conclude, as wave theorists find themselves on rather shaky grounds in attempting to account for sympathetic vibration, they say as little on the subject as possible. How different is their treatment of what is called "interference of sound," a pet subject with all wave theorists, for the very existence of the wave theory depends upon its acceptance and full recognition as an established phenomenon of sound. Yet *sympathetic vibration* is a self-evident fact in nature, whilst the so-called "*interference of sound*" has never yet been satisfactorily demonstrated to exist. This I shall prove to you by some of the most notable experiments brought forward by wave theorists—experiments of the tin tube, books, and candle calibre—to prove the interference of, and, accordingly, the existence of, *sound-waves*.

Sympathetic vibration deserves to be much more carefully investigated than it has ever been; and, as I know from

experience, it presents a most fertile and interesting field for study. Enough is known to assure one that the investigation will reveal some very curious and astonishing results and effects.

Allow me now to show you an experiment which is not mentioned by Tyndall, Helmholtz, or Mayer, or in any work on acoustics known to me. The result of this experiment is, perhaps, one of the most wonderful in the entire range of sound force demonstration. I attribute the silence of the text-books regarding this experiment to two things—firstly, to the fact that it is little known; and, secondly, to the fact that it is almost a hopeless task to explain it on the wave theory, however ingeniously the argument may be framed.

The piece of apparatus I now submit for your inspection is called, for want of a better name, the "acoustical turbine," or, in the language of Dr. Kœnig, "*Roue de réaction acoustique.*"

It consists of four small canister-shaped vessels of aluminum, closed except at their projecting necks. These vessels are resonators, accurately tuned to the note C^4, of 512 vibrations per second. The resonators are attached or suspended to the extremities of four arms, also of aluminum, provided at the crossing with a little agate cup, which rests upon a sharp steel point attached to a small stand. By this simple arrangement the suspended resonators are perfectly balanced and revolve with the greatest ease. The remaining part of the apparatus consists of a tuning-fork, C^4, perfectly in accord with the resonators, mounted on a resonant case.

The experiment is performed as follows. Placing the resonant case with its open end directly opposite the "turbine," which of course is perfectly motionless, I set the fork into vibration by bowing it at short intervals so as to keep up the discharge of sound force, and immediately the "turbine" commences to revolve and gradually gains speed until it moves round with considerable rapidity. The resonators move with their closed and flat ends foremost, carrying their open necks behind them, and they will move in no other way under the influence of sound force. If I set the turbine revolving in the opposite direction and then bow the fork, it will be observed that a diminution of speed instantly takes place, then the "turbine" comes to a stand-still, and then it slowly resumes its true motion. There is one important fact which must be mentioned—namely, that the apparatus will move with no fork which is not in perfect unison with the note to which the resonators have been tuned.

Attempts have been made to account for the action of this curious apparatus under the wave theory, but, to my mind, the reasons advanced are altogether insufficient, even if I believed in the existence of sound-waves. According to Drovák, who has written on the subject in *Poggendorff's Annalen*, the

revolution is caused by pressure within the resonators upon their closed ends. He argues that there is a node at the closed end of each resonator, and that the mean pressure of air in this node is superior to that of the air in repose. In the resonator the node is found at the bottom, and if the air in the resonator vibrates sufficiently to produce at the node, and, accordingly, close to the bottom, a mean pressure greater than the external air at repose, the reaction is there produced. This seems reasonable at first thoughts, but it will not stand careful analysis or investigation. Probably the ordinary wave theorist would claim that the revolution of the canisters is caused by the reiterated dashing of sound-waves or air-waves against them, just as he claims that the action of the sympathetic fork or of the tympanic membranes of our ears is caused by that same reiterated dashing. Should such air-waves and such mechanical dashing against the canisters exist, how comes it that the canisters revolve in the wrong direction? If we take a small card and quickly move it, so as to send off true air-waves, we find that, as the closed ends of the canisters present the largest surface to the action of the air, the turbine revolves in the opposite direction to that it takes under the influence of sound.

It is self-evident that in this interesting machine we see the effect of a mysterious cause—a wonderful illustration of sympathetic vibration, and evidence of the power of sound force which science has hitherto unacknowledged.

We are well acquainted with the marvellous powers of electric force, exerted upon objects at immense distances from its immediate or active source; and we know that a powerful magnet can stretch out its substantial but invisible hands, and pass them through solid obstructions, such as glass, wood, and metals which are not subject to magnetic influence, and lift or move ponderable bodies which are in sympathy with magnetic force, placed at considerable distances from its poles. But we are certainly not prepared to explain how the electric and magnetic forces do these wonderful things. So it is with natural sound force. We see in the sympathetic vibrations of tuning-forks and strings, and in the movement of the "acoustical turbine," evidences of a natural force operating in just as mysterious and subtle a manner as we observe electric and magnetic forces operating upon objects and substances in sympathy with them, and we cannot be expected, in the present state of scientific knowledge at least, to grasp the reason of one phenomenon more than another, whilst it may be in our power to satisfactorily prove how they are not accomplished.

Some time ago I submitted the problem of the revolution of the "acoustical turbine" to Dr. Hall for his consideration; and in his reply are the following remarks:—

"Let it be distinctly remembered that substantial but immaterial pulses of sound force do not act at all on material bodies, however light and easily moved, *unless their vibrational tension puts them in synchronous sympathy with that of the sounding instrument.* Hence, unless there were something connected with the four arms of this wheel having a tension in sympathetic synchronism with the substantial sound-pulses emitted by the C^4 fork, it is manifest that such pulses would produce no effect on the wheel one way or the other. But here is the fact that unlocks the whole mystery. The air column or chamber in each of these resonators is in exact sympathy with the C^4 fork, and has the same vibrational number, but as these air columns can only be reached in full power by the sympathetic force at the ends having the open necks, hence the substantial sound-pulses from the fork and its resonant case acting exclusively against that end of the air-chambers must necessarily drive the resonators in the direction which they do."

I leave this important subject of sympathetic vibration and movement with considerable reluctance, but it is imperative for me to move on to the consideration of the so-called *interference of sound*—a class of phenomena which has always been held in high favour by wave theorists as presenting unanswerable proofs of the existence of sound-waves, and accordingly of the truth of the wave theory.

You have all heard or read of this phenomenon of interference of sound, but have you all accepted the teaching of our acousticians on this matter as gospel? I hope not. I have both the assurance and the boldness to stand before you, the accomplished members of the most distinguished musical association in the land, and say that there is no such thing in existence as *interference of sound*, as taught in our text-books on acoustics. Before I proceed farther, let me ask you one question: Have you ever seriously realised in your minds what the musical effect of a full orchestra would be if there was such a thing as interference of sound, as taught by Professor Tyndall and the other great wave theorists?

Amongst the many misdirected and misrepresented experiments made by acousticians perhaps none are more amusing than those which have been brought forward with the view of proving the interference of sound. I shall briefly direct your attention to two or three of these experiments, and if they can be shown by anyone to clearly indicate the interference of sound-waves, and therefore the existence of sound-waves, I shall willingly abandon my opposition to the wave theory, and admit my error in advocating the theory which holds sound to be, like electricity, one of the primordial forces of nature.

Turning to the pages of the leading English text-book on

sound, we find these statements: "When two unisonant tuning-forks are sounded together it is easy to see that the forks may so vibrate that the condensations of one shall coincide with the condensations of the other, and the rarefactions of the one with the rarefactions of the other. If this be the case, the two forks will assist each other. It is, however, also easy to see that the two forks may be so related to each other that one of them shall require a condensation at the place where the other requires a rarefaction; that the one fork shall urge the air particles forward, while the other urges them backward. If the opposing forces be equal, particles so solicited will move neither backwards nor forwards, the aerial rest which corresponds to silence being the result. *Thus it is possible by adding the sound of one fork to that of another to abolish the sounds of both. We have here a phenomenon which, above all others, characterises wave-motion.*"

The same authority tells us how this *silence* is to be produced. He instructs us to place the two forks half a wave-length apart, and to set them in vibration, and he then asks—"What must occur? Manifestly the rarefactions of one system of waves will coincide with the condensations of the other system, the air (beyond the second fork) being reduced to quiescence. . . . The action here referred to is called *Interference*."

Now I unhesitatingly affirm that there is not one atom of truth in the statement made, and I defy any experimenter with two forks, or, indeed, with any two sounding bodies, to produce silence in the manner so clearly laid down. Here are two unison forks, made by the greatest manufacturer of acoustical apparatus who has ever lived, Dr. Kœnig, of Paris; let anyone produce silence with them, placed in any relative position, whilst they are both in vibration, and I shall acknowledge the law of interference. I cannot do it, and I say it cannot be done. So much for text-book teaching.

I have not by any means done with the teaching of this text-book. Turning to page 397 of the last edition of Professor Tyndall's "Sound," we find allusions to certain details connected with the "double siren" of Helmholtz. The most interesting are those relating to an experiment mentioned as proving the law of interference of sound. After pointing out that if the circle of twelve orifices is opened in each of the divisions of the instrument, directly opposite each other, "sounds flow together in perfect unison, the unison being maintained, however the pitch may be exalted", the Professor informs us that this unison is disturbed by moving the upper wind chest, and then adds: "In the case before us, where the circle is perforated by twelve orifices, the rotation through $\frac{1}{24}$th of its circumference causes the

apertures of the upper wind chest to be closed at the precise moments when those of the lower one are opened, and *vice versâ*. It is plain, therefore, that the intervals between the puffs of the lower siren, which correspond to the rarefactions of the sonorous waves, are here filled by the puffs or condensations of the upper siren. *In fact, the condensations of the one coincide with the rarefactions of the other, and the absolute extinction of the sounds of both sirens is the consequence.*"

The Professor continues—"I may seem to you to have exceeded the truth here, for when the handle is placed in the position which corresponds to *absolute extinction, you still hear a distinct sound*. . . . The reason is this. The sound of the siren is a highly composite one. By the suddenness and violence of its shocks, not only does it produce waves corresponding to the number of its orifices, but the aerial disturbance breaks up into secondary waves, which associate themselves with the primary waves of the instrument, exactly as the harmonics of a string, or of an open organ pipe, mix with their fundamental tone. When the siren sounds, therefore, it emits, besides the fundamental tone, its octave, its twelfth, its double octave, and so on. . . . Now, by turning the upper siren through $\frac{1}{24}$th of its circumference, we extinguish utterly the fundamental tone. But we do not extinguish its octave. Hence, when the handle is in the position which corresponds to the extinction of the fundamental tone, instead of silence, we have the full first harmonic of the instrument."

I cannot pause to comment fully upon the passages quoted, which, however, may be said to present about the loosest piece of scientific reasoning to be found in our text-books. We are first told that "the absolute extinction of the sounds of both sirens" takes place; then we are informed that we "still hear a distinct sound." Further we are told that the fundamental tone is "extinguished utterly," whilst we hear its "full first harmonic." Just imagine the existence of a "full first harmonic" of a fundamental tone where there is no fundamental tone!

Now the phenomenon, if it may be called one, which is observed when the two portions of the siren are so placed as to bring the puffs of one exactly between the puffs of the other has nothing whatever to do with interference of sound, and this fact must be self-evident to the youngest student of acoustics. The true explanation is this. When the circles of twelve orifices are exactly opposite each other, the puffs from both occur together, and a musical sound is produced equal in pitch to that yielded by a single revolving disc of twelve orifices, moving at the same velocity. Suppose the two discs revolve together twenty-two times in a second,

the note produced would be C^3 of 264 vibrations. If we now turn the upper portion, or wind chest, of the siren $\frac{1}{24}$th of its circumference, so as to bring Professor Tyndall's *interference* into operation, we certainly no longer hear C^3 of 264 vibrations, but, as a simple matter of course, C^4 of 528 vibrations. The combined discs of the single instrument, fed by the same air tube, now yield, instead of twelve double puffs to each revolution, twenty-four single puffs to each revolution. The mystery is solved, but where is the *interference of sound* and the consequent proof of the existence of sound-waves? In case my brief explanation might not be perfectly clear to you all, I have prepared a diagram of the two siren discs, which will make my meaning evident at a glance.

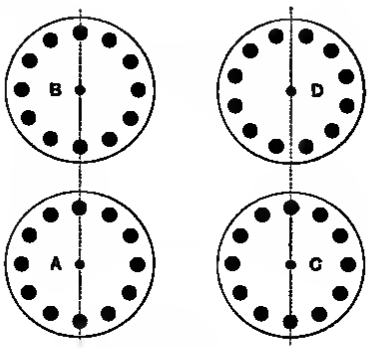


Fig 2

In Fig. 2, two pairs of discs are shown. The two discs A and B are in the relative position which places the circles of twelve orifices exactly opposite each other (as indicated by the dotted line), when the puffs from both occur together, producing, say, the note C^3 of 264 vibrations. The two discs C and D are in the relative position which places one series of twelve holes exactly between the other series of twelve holes, thus yielding 24 puffs at each revolution, and,

accordingly, producing the note C^4 of 528 vibrations. The dotted line shows the altered relation of the discs C and D.

Turning now to the section of Professor Tyndall's book devoted to the "Interference of Waves from a Vibrating Disc," we find a most interesting experiment treated in a rather curious and one-sided manner. The writer remarks: "We are now prepared for a very instructive experiment, which we owe to M. Lissajous. Drawing a bow over the edge of a brass disc, I divide it into six vibrating sectors. When the palm of the hand is brought over any one of them, the sound, instead of being diminished, is augmented. When two hands are placed over two adjacent sectors, you notice no increase of the sound; but when they are placed over alternate sectors, a striking augmentation of the sound is the consequence. By simply lowering and raising the hands, marked variations of intensity are produced. By the approach of the hands the vibrations of the two sectors are intercepted; their interference right and left being thus abolished, the remaining sectors sound more loudly. Passing the single hand to and fro over the surface, you also hear a rise and fall of the sound. It rises when the hand is over a vibrating sector, it falls when the hand is over a nodal line. Thus by sacrificing a portion of the vibrations we make the residue more effectual."

We have here an experiment performed in a decidedly one-sided manner, and an argument which badly wants a little of the light of common sense let in upon it. Before I proceed to my experimental demonstrations, let me assure you that interference of sound, as understood by the wave theorist, has nothing to do with the phenomena of the vibrating disc or plate just described, but that we have to credit *resonance* for all the increase of sound observed.

Throughout this notable experiment of the Professor's it must be realised that he supposed the ear to be placed *above* the level of the brass plate, and quite overlooked two very important things—in the first place, that the plate had two sides equally capable of producing condensations and rarefactions, and, in the second place, he quite forgot to test what result would follow to the ear placed over the plate when the hands were applied to the underside of the plate. Now this latter matter was certainly a very grave oversight on the part of so skilful an experimenter, as I shall proceed to show.

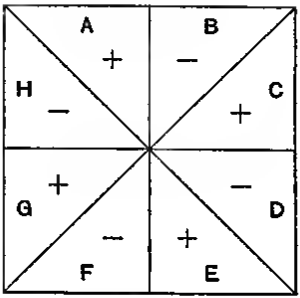


Fig. 3.

I have here a square plate of brass, specially made for this experiment by Dr. Kœnig, and I earnestly ask your close attention to the sounds it will produce, for I am afraid they will not carry far with any degree of clearness. I have also brought a diagram showing one way in which the plate divides itself into vibrating sections and nodal lines when bowed. I shall now divide the plate into the eight sections as shown on diagram Fig 3, as that is the nearest to the division mentioned by Professor Tyndall, and answers perfectly to illustrate the absurdity of the interference hypothesis. I sprinkle sand over the plate and bow its edge. The sand has arranged itself like the lines on the diagram and you hear the sound it is sending forth from each equal section, now in rapid vibration.

Observe the following effects. As the hand is a clumsy article in so delicate an experiment I have made wooden and cardboard covers to suit all the divisions of the plate. Taking one of the wooden covers I bring it down over only one of the divisions, say, A, and immediately you hear an augmentation of the sound, and as I raise and lower it you hear the sound falling and swelling out. Now leaving the *top* of the plate with its *condensations* and *rarefactions* to take care of itself, I apply the board to the same division on the *underside* of the plate, and you observe that the effect is precisely the same.

You will remember that Professor Tyndall states that "when two hands are placed over two adjacent sectors you notice no increase of the sound." Just let me test this. The plate is now sounding, and I cover two adjacent sectors, say, A and B or B and C, or any two in any part of the plate,

with the result of a marked augmentation of the sound in each and every case. I do the same underneath the plate with exactly the same result. In fact, it is impossible to cover any two sectors, above or below, without an augmentation of sound.

I now cover any half of the plate—namely, H, A, B, C, or A, B, C, D, and still the sound is increased, and finally I cover the entire square with a similar result.

From these facts it must be obvious to any person with any reasoning powers that the idea of *interference* is a myth, and that the cause of the augmentation of the sound is the *resonance of the air column contained between the board and the surface of the sonorous plate.*

Time will not permit my going into the consideration of the other experiments in support of the so-called interference of sound, and I need only say that every one which has come under my observation is capable of being just as easily accounted for and refuted as those I have alluded to and tested.

In conclusion, I must assure you that many weighty arguments against the truth of the wave theory, and, accordingly, in support of the substantial theory, remain untouched. Chief amongst these is what is known as the "Locust argument." An hour's talking would hardly exhaust this fertile subject, so, with just a suggestion of its nature, I shall leave it for future consideration. "There is a well-known insect," says Professor Henry Mott, "one of the *locustidæ* (a saltatorial family of the order *orthoptera*), whose stridulations can be heard a distance of more than a mile, as attested to by Darwin and others. This insect weighs less than a quarter of a pennyweight, and can, by simply rasping its legs across the nervures of its wings (for this is the way its tone is produced), according to the wave theory, create a physical agitation and displacement of the air which converts four cubic miles of atmosphere into waves consisting of condensations and rarefactions, the compressed portions of which contain a sufficient augmentation of heat above the normal heat of the atmosphere to add one-sixth to the elasticity of the air and the velocity of sound." I am much tempted to go into some of the very astonishing calculations which have been based on the energy of the locust in strict accordance with the demands of the wave theory, but must refrain and close this paper, which is already much too long.

Commending the entire subject to your dispassionate and attentive consideration, and thanking you for your courteous and patient attention, I conclude.

DISCUSSION.

THE CHAIRMAN.—Ladies and gentlemen, this subject is likely to provoke a considerable amount of discussion, but we must first tender our hearty thanks to Mr. Audsley for the very interesting paper he has presented to us on this occasion. There is very little for me to say on the subject, because, of course, it is a special branch into which the practical musician does not always enter. He should, however, be scientific as well as pleasing to his listeners, and I hope, therefore, that musicians will thoroughly appreciate the importance of going into this branch of the study. I will call on Mr. Sedley Taylor to open the discussion.

Mr. SEDLEY TAYLOR.—I feel that the subject is a very extensive one; we have had a great many interesting points raised which it would be utterly impossible for me to touch upon *seriatim;* to do so would exhaust all the remaining time, and prevent your hearing anybody else. I think, therefore, the best thing I can do is to pass very briefly over the notes I have made, and refer to but a few of the leading considerations which appear important with regard to the alternative between two theories which has been laid before us. In passing, I may say that the reader of the paper placed the beginning of the undulatory theory at too early a period of antiquity, for I understood him to say it was for some 2,000 years that this theory had held possession of the field; but, according to my recollections of the history of science, it is a comparatively modern thing. I do not think that before the time of Newton—and certainly not before that of Galileo—there was any definite idea of the propagation of sound according to the wave theory; in any case, that theory has not been in existence for anything like 2,000 years. I should like to say that in the progress of an exact science like acoustics, acceptance of a theory on mere authority has no place at all; yet the matter has been represented by the reader of the paper as if acousticians had blindly, like so many sheep, accepted the dicta of particular philosophers; I do not think that corresponds with fact at all. The best man wins, and the best theory wins. No doubt mere popular expositors of a theory often adopt without examination what is put before them by a discoverer, but those who have made the history of this subject what it is have secured each step at the point of the bayonet; they have had to fight for each step made, and I can therefore see no justification for saying with Mr. Audsley that there is a total want of common sense in a man like Newton or Galileo. However, the question before us now is whether the wave

theory is false or not. Great stress has been laid by Mr. Audsley on the writings of Professor Tyndall on this subject, and he has assumed somewhat too hastily that whatever Tyndall states necessarily represents with undeniable accuracy the facts of acoustical theory. Now, as I some time ago, in the pages of *Nature*, pointed out that in the first two editions of Professor Tyndall's book on sound there was a mistake which vitiated an entire chapter and showed that he had radically misunderstood Helmholtz's theory of consonance and dissonance, I cannot be expected to defend everything Tyndall has written. Whether his experiment with the candle was futile, as Mr. Audsley contended, must depend on whether the scope of the experiment as made by Tyndall coincides with that of its reproduction here. In any case, however, if Tyndall, who is no doubt an eminent popular exponent of this science, but not a theoretical authority in it, has made a mistake, that supplies no presumption against the wave theory of sound. Mr. Audsley complains that wave theorists talk about sound as being something in the air and also something in the human ear, and so confuse these two things together; but I think he practically claimed for his own theory exactly the same privilege, sometimes speaking of sound in the air and sometimes of sound in the ear. A real distinction unquestionably exists between these two senses of the same word. By sound in the air we mean vibrations, by sound in the ear we mean a sensation. But the distinction is so obvious that no confusion need arise between these two senses in which the same word is used. When we talk, for instance, of sound travelling through the air, we mean the propagation through it of particular mechanical vibrations, and any other phraseology would be cumbrous and pedantic, since it would supply no corresponding increase of clearness. Passing from preliminary matters, I come now to the "substantial" theory itself. I confess that I failed to gather from the definition given in the paper what is the precise nature of that theory. Perhaps Mr. Audsley would kindly read over again the sentences in which he defined the substantial theory. The undulatory theory may, of course, be erroneous, but it is at least based on precise and clearly intelligible conceptions, which I am as yet unable to see is the case with the theory which Mr. Audsley seeks to put in its place.

Mr. AUDSLEY.—Perhaps I may explain without reading. The new theory claims that sound is simply a force of nature, precisely as electricity and magnetism are forces of nature.

Mr. JACQUES.—How would you define a force?

Mr. AUDSLEY.—It may be simply defined as that element in nature which *does* something. You know what a magnet can do; it can lift a piece of iron—therefore it is quite obvious

that magnetism is a force capable of doing something when it thus moves inert matter.

Mr. JACQUES.—Do you think that exists apart from the matter of the magnet? Has any force an existence apart from matter?

Mr. AUDSLEY.—Force exhibits itself through the agency of matter.

Mr JACQUES.—Therefore there must be matter exerting force.

Mr. AUDSLEY.—Matter must be present for the exhibition of force.

Mr. JACQUES.—If I understand you, in one part of your paper you were rather throwing ridicule on the notion that force could be a result.

Mr. AUDSLEY.—Force cannot be a *result* or an *effect*, as it is in all cases in nature a *phenomena-producing cause*.

Mr. JACQUES.—On the other hand, if it emanates from matter—

Mr. AUDSLEY.—It cannot exhibit itself without matter.

Mr. JACQUES.—Then matter must be in existence before the force exhibits itself.

Mr. SEDLEY TAYLOR.—The point I was anxious to make out was the precise sense in which the words "substantial" and "immaterial" were used. We were told the force was a substantial force, and that it was also an immaterial force. I noted down the words "substantial entity" and "objective existence," but these expressions employed to describe a force convey no definite idea to my mind.

Mr. AUDSLEY.—A great number of eminent scientists have experienced a great difficulty in realising what is exactly meant. The clause that you want me to read is this: "Sound is one of the primordial forces of nature, it is a substantial force or an immaterial objective entity, governed by laws ordained and fixed immutably by the Great Architect of the Universe."

Mr. SEDLEY TAYLOR.—The words "immaterial objective entity" do not seem to me to convey a definite idea.

Mr. AUDSLEY.—Then I gave the founder's definition of that so that there should be no mistake about it. [Mr. Audsley here quoted a passage from the paper (p. 114), beginning "To concede to science," &c., to the words "moving cause."]

Mr. SEDLEY TAYLOR.—I will then merely venture to say that I am not a metaphysician, and that these words convey nothing on which my mind is able to take hold. In asserting, as is done in the paper, that a body in motion must necessarily be acted upon by a force, Mr. Audsley goes right in the teeth of the "first law of motion" established by Galileo, and on which Newton based the theory of universal

gravitation. That law lays down that the mere fact of a body being in motion does not show that it is under the action of any force; nay, that if the body be moving in a straight line, and with uniform velocity, that is conclusive evidence that the body is acted on by no force, or by a system of forces which neutralize each other's action so that their resultant force on the body is zero. Galileo and Newton may, of course, be wrong in this matter, and Mr. Audsley and his friends right, but this is certainly not self-evident; it will have to be proved if it is to be accepted. Mr. Audsley has very confidently asserted that sound transmitted through the air is incapable of setting matter in vibration, except in cases of "resonance" or "sympathy." Now with regard to the experiment which was shown us with the gold leaf, I do not believe myself that if ten times as loud a sound had been made, the gold leaf would have been moved. I quite agree to that; but I can produce an experiment of a more delicate kind, which I contend is practically decisive of the issue. I understood Mr. Audsley to say that the yes or no of the whole question between the "wave" and "substantial" theories of sound depended on whether a tuning-fork can or cannot set a neighbouring material object, with which it is not in contact, into vibration, apart from the special case of sympathy. Now, although the gold leaf was not delicate enough to show vibration, if you take a film of fluid sufficiently thin, you will find that a tuning-fork can transmit to it a visibly recognisable state of vibration. Spread a soap film over a small horizontal aperture, wait until the colours show themselves, and then bring a prong of a smartly struck tuning-fork close to the film. The changed arrangement of the colours which will instantly result will show that the film is agitated by the action of the fork's prong. This experiment seems to me to dispose of any theory involving the assertion that a sounding body is incapable of communicating through the air vibratory motion to any other body except in the single isolated case of sympathy, of which the experiment adduced by me is wholly independent. I should like to ask Mr. Audsley how it comes to pass that this "substantial" force is obliterated when the air disappears. We all know the ordinary experiment of ringing a bell under the receiver of an air-pump. When the receiver is exhausted, so that there is no air left in it, the sound ceases, although, by means of an electric communication, the clapper be kept striking the bell. The cessation of the sound at once explains itself on the undulatory theory, because the particles which are wanted to carry the sound from the bell are taken away by the exhaustion; but it would seem that an "immaterial" force ought to pass through a vacuum as readily as through matter in any of its forms, gaseous, liquid,

or solid. I should like to know how the advocates of the substantial theory deal with this point. Mr. Audsley pronounces the phenomenon, described in the writings of acousticians by the term "interference," to be totally non-existent. In reply to that I would refer to the well known experiment in which sound from one prong of a tuning-fork is conducted through two tubes of unequal lengths which finally open into a common orifice. When the relative lengths of the tubes are adjusted in a particular manner, all but complete silence prevails at their common orifice. This experiment is described in Tyndall's book, I have tried it over and over again with success, and, in my judgment, it completely establishes the reality of the phenomenon of interference which Mr. Audsley asserts to be non-existent. The only point raised in the paper which seems to me to constitute any real difficulty in respect to the wave theory is the extreme slowness with which the prongs of a tuning-fork must move when emitting the faintest audible sounds. I do not doubt, however, that this difficulty, such as it is, will yield when it is taken in hand by an investigator possessing such command of the higher branches of mathematics as is essential for original dealing with most acoustical problems of any difficulty. On the whole, then, I am far from thinking that the arguments advanced in the paper and the experiments made before us have demolished the wave theory of sound, and it appears to me that the alternative theory, as it has been here presented to us, is little more than the very vague statement that sound is a primordial force. We are not told what are the laws of that primordial force, and, in the absence of such information, there seems to be no basis from which to start in working out a scientific theory and applying it to the exact calculation of acoustical phenomena.

Mr. A. J. Ellis.—So much allusion has been made by the lecturer to Professor Helmholtz, whose work I had the honour of translating, that I feel I ought to make some observations upon the subject. I will start with the interference of sound. With regard to that, I think if you take an ordinary tuning fork, and sound it, and then turn it in your fingers before your ear you will hear the sound disappear and re-appear. If that is not interference, what is it? It is one of the simplest and commonest experiments that are made. With regard to Helmholtz's double syren, I do not see how Mr. Audsley established that, because the primary tone was destroyed, therefore you heard the double tone; that is to say, that the condensation and rarefication answered to one another and produced the octave or the double vibration. I do not see how that was proved at all. Then again with regard to the statement that has been made that sound was a

primordial force of nature. Without having any hypothesis to calculate upon from that, I do not see that that explains anything whatever. It is true that we may say electricity is one of the primordial forces of nature, but though we do not know the least in the world what it is, we know what it does, and we have plenty of theories which can be worked out from it mathematically. When Mr. Audsley has furnished some theories which you can work out mathematically with regard to this sound force, then I think it will command attention from mathematicians and physicists generally, but at present I do not see that we have anything to discuss. He says there are certain points of difficulty, and the acoustic turbine was a point of difficulty, but he had already quoted some explanation which was given in Poggendorff's Annals. I do not know the experiment sufficiently to be able to speak about it farther than that, but I do not think that he proved that sound is a primordial force of nature which was immaterial, and yet moved a material substance. There is that great difficulty in it. However, this is a subject that cannot be discussed in five or ten minutes at the end of an hour and three quarters' lecture. It has to be laid down in books with a number of experiments suggested and carried out, and if there is anything that it proves which the wave theory does not prove then physicists will have to consider it with very great care, but at present I do not see that they are called upon to do so.

Mr. Blaikley.—Mr. Sedley Taylor and Mr. Ellis have touched upon the points that struck me most forcibly in what we have heard, but I may add one word with respect to Professor Tyndall's work on Sound. I have always read it and understood it (and I heard the original lectures) as an epitome for comparatively popular reading, as it were, of Helmholtz's work, and not as embodying any very deep researches of Professor Tyndall's own, or as constituting a work on the theory of acoustics in precise scientific language. With respect to that experiment of the pulse of air driven through a tube, no doubt in many cases some actual wind travels through, but as I understand the experiment recorded by Professor Tyndall he gives it as an illustration merely of the fact that it is not necessary that the body of air should travel through a tube. He gives it as an instance of the nature of a pulsation, which he illustrates by putting smoke at one end of the tube, none of which smoke appears at the other end where the candle is blown out. With respect to the point made with regard to the actual motion of the prong of the tuning fork and the rapidity of the motion, I never read the statements either in Helmholtz's work or in Tyndall's as conveying the meaning they have according to Mr. Audsley. I understood these writers when the

question of rapidity was entered upon to refer to the rapidity of the vibration and not the rapidity of the motion in feet or inches per second, which is, of course, a totally different thing. I understand rapidity as greatness of frequency. Then when we consider the question of the amount of amplitude of the tuning fork's vibration, I cannot understand the point that is made of it. No doubt it is very marvellous if we consider that a beetle's legs or wings can affect many tons of air and set them in vibration, but it appears to me one sees other things in nature equally marvellous, and I do not feel at all convinced yet that there is much force in what we have heard on this point. With regard to the reception of sound or perception of sound by the ear, why should it be more wonderful or inexplicable that the ear can receive a multiplicity of waves of different forms, periods, and so forth, constituting different tones, than that the retina of the eye can receive an innumerable number of waves, giving innumerable co-existent impressions of different colours and different forms? If it is inexplicable in the case of the one organ it is equally so in the case of the other, I think. The question of sound in a vacuum has been touched upon. With respect to the experiment of the tuning fork and the gold leaf there is this question to be considered, that we cannot conceive of a tuning fork sending out puffs of wind in one direction without remembering that there is a return of the air immediately after, hundreds of times in a second, according to the period of the fork, and therefore the eye could not detect the to-and-fro motion of the slip of gold leaf at that rate. It would not be in one direction only, as if wind were propelled out from the tuning fork without returning. The gradual change from visible pendular motion to invisible pendular motion causing sound is illustrated by the common experiment of a slip of wood fixed in a vice, and gradually shortened down, through which shortening that which was visible motion becomes faster until it is recognised only as sound by the ear. The point suggested by that experiment I should like to have heard more touched upon in the paper. There is another common acoustical experiment: the gradual change from a condition of things the eye can appreciate to that which can be appreciated only by the ear, as in the vibration of a heavy contra-bass string. A few years ago, through the kindness of Mr. Stroh, I had the opportunity of producing records of wave forms found in air by means of his apparatus. The bells of horns, such as the one used this afternoon by Mr. Audsley, and other instruments were held near the registering membrane while notes were being sounded, with very beautiful results. The pen recorded many varieties of wave forms, which could have been received only from the air.

If such aerial wave forms can thus affect a mechanical apparatus, why cannot they affect the ear in the same way?

Mr. Webb.—If the wave theory is not true, how is it that an organ pipe is doubled in tone by stopping the end of it? As for the vibrations of the tuning fork being transmitted, you can test that out very easily by putting it to the end of your teeth, when you will at once find exquisite pain occasioned.

Mr. Jacques.—Does not the fact that puffs through the holes in a revolving card produce a musical sound tell against Mr. Audsley's view? Surely he cannot be unaware of that fact, and I wish he had mentioned it in the course of his lecture. No doubt he will be able to give some explanation as to the puffs of air becoming sound merely when they become rapid.

Mr. Audsley.—I now realise exactly the same difficulty that I realised when writing the paper. I had to leave so much unsaid, although my paper occupied 103 pages of MS., that I found the ground I had left untrodden was about ten times as much as that I had covered; and the important points these gentlemen have discussed are the points I am perfectly prepared to treat in another lecture at a future time. To enter into them at the present time would only weary you, and after so long a paper would be out of place. If the Society feels the slightest inclination to follow up this matter I shall be very glad indeed to take up many of these points in another paper. In the first place, with regard to Mr. Sedley Taylor's remarks as to the vibration of a film of fluid, I understand that that film is suspended over an air chamber.

Mr. Sedley Taylor.—No, over an aperture.

Mr. Audsley.—There is an air chamber underneath the film, so I should presume it is another question of resonance.

Mr. Sedley Taylor.—No, it does not matter what pitch the fork is.

Mr. Audsley.—Still there is this peculiarity of air, that sounding bodies have the power of making resonance chambers, so to speak, in it to suit themselves, otherwise we should find it an extremely difficult matter to deal with sound in our every-day life. Air is one of the finest resonators in existence, as is shown by an organ pipe or any other resonance chamber. Take a fork that you can hardly hear sound at all, place it opposite a chamber that is full of air, and you will immediately find that sound is given forth very readily, the more readily in proportion as the contained volume of air gets nearer to perfect sympathy with the fork. Now the fork cannot produce any more mechanical effect when held before an enclosed air column than it can in the open air, but it will give a sound one hundred times as loud as it produces in the open air. Air accordingly gets

very readily into vibration, and liberates sound or pulses of sound force. With regard to the film, although I have never experimented with it, I should imagine, considering the matter hastily on the basis of other and somewhat similar experiments, that it is the air that is in the immediate neighbourhood under or over the film that is affecting the film *in portions* with sound pulses. When the film happens to be in perfect sympathy with the sound force, it directly responds as *a whole*. You must take that as my explanation on the spur of the moment. You have had an opportunity of performing such experiments, but I have not experimented with these films. I am quite convinced that the effects are not caused by air waves, but by sound force affecting the air in sympathy with it in the immediate neighbourhood of the film, or probably in sympathy with the film itself. Now there is no object in Nature too light to be affected by sound force in sympathy with it. I am not bound to explain what sound is any more than I am bound to explain what magnetism is; but if I may say that magnetism is a natural force I say sound also is a natural force. I grant this has to be proved. As to the conduction of sound in air, it must be realised that sound requires a conducting medium precisely as in the case of electricity or magnetism. Air is one of the great natural conductors of sound, and when you remove the air you remove the means of conduction. From the very fact of sound being a natural force it has certain laws controlling it, and two of the grand laws are that sound shall be generated by the molecular vibration of a sonorous body, and that it shall be conducted by some medium. Those are the two conditions you start with; remove the air and you immediately remove the power of the sound force being conducted. We know it is conducted in wood about fifteen times faster than in air, and the wave theorists certainly cannot tell me why; when one scratches one end of a long balk of timber with a pin the sound of the scratch is heard distinctly by an ear pressed against the other end, whilst it could not be heard through air at the distance of a few inches. Wood in this case is the better conductor. A watch laid on a balk of timber will sound to the ear pressed against the other end almost as loud, in fact, much louder than to the ear held close to the watch in the open air. Will the wave theorists say that the whole of that balk of timber, many yards long, is put into vibration so many hundred times a second by the ticking of the watch? I do not think we are prepared to believe that the tick of the watch can possibly send off sound waves to go through a balk of timber, say, twenty yards long, in the fraction of a second, according to the pitch of the sounds of the watch. However, these are things that I have not touched upon on the present occasion, but which

I should be glad to discuss more fully. I was bound to leave the question of the conduction of sound entirely out of my paper. With regard to the "interference of sound," I contend that is simply a question of perfect or imperfect resonance. I think sympathetic vibration and resonance are two of the great phenomena we have to study with regard to sound, and neither of them has been studied sufficiently. I hold that those two classes of phenomena point more clearly to what sound really is than any other. Now as to the vibration of the prongs of a fork—I have a book by Professor Mott, of America, who is also a distinguished member of one of our London societies, an engineer of considerable renown, and a chemist of very great parts; but I should be afraid to show you the list of calculations he has made upon vibrations of tuning-forks; I think they go to eleven figures, but I have stopped at seven figures. The tuning fork Mr. Ellis referred to, held on the angle, is another matter I would not only have introduced, but would have experimented with to-day, but it was impossible to do everything, and I would rather you would allow me to leave it to my next lecture. It is one of the proofs of the new theory of sound. With regard to the double syren producing the octave, I think Mr. Ellis misunderstood me. I did not accuse Professor Helmholtz of making a mistake; I accused Professor Tyndall of using the double syren and making a mistake with it. Tyndall says, when the holes of the upper and lower wind-chests are open, so that you get twelve double puffs, that is, twelve from above and twelve from below at each revolution, you have then the fundamental tone; you have, as I say, if the disc is revolving twenty-two times in a second, C, with 264 vibrations, that is, twenty-two multiplied by twelve. Now so long as the syren remains with the discs in this position, you will only get a powerful sound of that pitch while the wheel is revolving twenty-two times a second; but now change the phase—change the disc so that you have the puffs from the upper syren coming between the puffs of the lower syren; you have now twenty-four puffs at each revolution of the disc, hence you get the octave above. The mistake that Tyndall makes is in saying that the fundamental tone is destroyed through *interference*, and the note you hear is the "first harmonic." How can you hear the harmonic when there is no fundamental tone? With regard to Tyndall's being simply a popular book, if it must be looked upon in that light only and not as a correct exposition of the science of acoustics as at present taught, the sooner it is done away with the better, and let us have a proper one in its place. At present we have no book we can apply to as an exponent of the ordinary facts of acoustics that every student is supposed to master and to accept.

Much of the book is correct, of course—that which simply tells us of the phenomena of sound I do not dispute. In many cases the results of experiments are the same, but the conclusions deduced from them are distinctly different. I showed you by the Chladni plate experiment that instead of the facts being as he represents them they are entirely opposite, and it is a pity that the theory, if it is a sound one, should be connected with such unsatisfactory experiments. I agree most decidedly with Professor Huxley that if one hypothesis can be proved false the whole must go. With regard to the movements of the fork being frequent, I think my reading is the right one in this way. You are told that a pendulum cannot create sound because it is not fast enough.

Mr. BLAIKLEY.—Its frequency is not fast enough.

Mr. AUDSLEY.—You can reduce that by calculation. The frequency cannot amount to anything when the aggregate is only the small fraction of an inch in a minute, because you see it must start sound waves 4 ft. 4 in. long by blows of the prongs only swinging the one four-millionth of an inch.

Mr. BLAIKLEY.—I do not see the mathematical impossibility.

Mr. AUDSLEY.—It has been fairly well proved, I think, but a question will always remain; one will say it is impossible, and the other will not realise the impossibility of it. As to the ear and the eye receiving sound and light, they are both equally wonderful. Light is a *force of nature* and not a *mechanical motion*, and sound also is a *force of nature* and not a *mechanical pulsation*. We know what light has passed through, and we do not know that we have quite arrived at what light really is. Newton's theory was exploded, and we then got the ether theory. Now we have got to the ether-jelly theory, and it is possible a little later on we may get to the substantial theory; but at all events, light is not to stand still in the ether-jelly stage, I am quite certain. There are other minds coming which will probably grapple with this question, and who will send the ether-jelly theory of the present day into the limbo of exploded hypotheses, to follow Newton's corpuscular theory. I recognise light, electricity, and sound as all great forces which do not depend on any mechanical action whatever. It was said that membranes are affected by a sounding instrument; doubtless, and in the same manner as are the films mentioned by Mr. Sedley Taylor. Where you set up a sympathetic vibration you are able to get most wonderful results. The membranes alluded to are amongst the series of experiments I alluded to when I mentioned that sympathetic vibration ought to be more studied.

Mr. BLAIKLEY.—I do not consider it a case of sympathetic vibration in the cases I mentioned.

Mr. AUDSLEY.—Then a question was put about organ pipes,

stopped and open. I should explain the matter thus: air has the peculiar faculty of creating in itself, where it possibly can, a sympathetic column. In an open pipe you know that the vibrations at the mouth divide that pipe into two great columns divided by a node. Cut that pipe in half and stop it, and you have very nearly the same pitch of sound. In stopped pipes you cannot create the same double column; the column is confined to the resonance chamber. With the revolving syren, with puffs of air sent into the atmosphere immediately in the neighbourhood, it creates vibration which releases the sound force from the atmosphere just the same as a tuning fork opposite a resonance chamber releases the sound force from the volume of air retained within. All you have to do is to disturb the molecular structure of the sonorous body. I want you to understand very plainly what a sonorous body is. If it is merely capable of vibration every body is equally sonorous, but a piece of wood that is made to move to and fro 256 times in a second with the same amplitude as a tuning fork will not only not be heard, but would not be heard if it so moved an inch at each swing. So long as you do not disturb the molecular structure of the wood you do not get any sound from it. Tap it and immediately you get a sound. The whole theory of a sonorous body lies in this fact—that its structure is so constituted by nature that when it is set into vibration its molecular structure releases two forces—one is heat and the other is sound—and in proportion as the sound force predominates over the heat force, so is its sonorous quality improved. There are some bodies that release practically no sound force at all under ordinary conditions, and the result is that the mechanical energy expended in their vibration is entirely displayed in heat. I think that is about all I can venture to say to-day.

The Chairman.—I am sure you must all rejoice that this subject will be resumed on another occasion. I am sorry to say it cannot be during the present session, because all the dates are filled, but we have Mr. Audsley's promise to come amongst us again, when we shall hope to be able to thresh the matter out more thoroughly.

A vote of thanks was then passed unanimously.

May 5, 1890.

Major G. A. CRAWFORD

In the Chair.

FURTHER "NOTES" ON THE ORGAN. SUGGESTED BY PAPERS OF SIR F. A. G. OUSELEY AND MR. AUDSLEY.

By Somers Clarke, F.S.A.

In venturing to read this paper, I have not undertaken the work with the view of giving instruction, but rather of eliciting information from those who are better able than myself to teach.

I hope also that it will not be thought I am going over old ground; I hope to avoid this, although I am aware that two papers have already been read here, and which deal with the organ, one by Mr. G. A. Audsley, the other by Sir F. A. G. Ouseley.*

The subject—namely, the treatment of the organ with regard to its position, the provision to be made for it, the position of the keyboard, &c., is so large that the papers above referred to are by no means exhaustive. They have indeed suggested many questions, some of which may, perhaps, find an answer to-day.

The historical side of the case, that upon which Sir F. A. G. Ouseley first enters, is very interesting. The paper read by Mr. Hopkins, and published in the Transactions of the Archæological Institute, goes very fully into the subject and, I think, with much more sound views than those expressed by Sir F. A. G. Ouseley.

For the present, however, I do not want to introduce history or archæology into the field, but to consider the subject as we find it before us to-day.

There has been a sufficient change in our ritual, knowledge of music, construction of organs, and mechanical resources

* "On the Position of Organs in Churches" Sir F. A. G. Ouseley, Bart. Proceedings, Musical Association, 1885-86.

"Matters, chiefly Architectural, relating to the Accommodation of Organs" By George Ashdown Audsley Proceedings, Musical Association, 1888-89.

to place the whole question upon a very different footing from that on which it stood, even thirty years ago, and we have to deal with things as they are.

With regard to the position of the organ in a church (and I propose to deal with church organs only), it does not seem reasonable to cite, as is commonly done, the arrangements at churches such as Milan, Seville, Cologne, Strasburg, and others, many of them buildings larger than our biggest cathedrals or abbeys, and then to draw any deduction from these to apply to our ordinary parish churches. We might almost say that in England we deal with inches, where these spacious structures deal with feet, so great is the difference in scale between the buildings.

This difference may be found even in our parish churches. Let us compare for a moment two great cities, London and Paris. London has in it only two large churches, St. Paul's and the Abbey. In Paris most of the older parish churches are more spacious than, although not actually as long as, Lichfield, one of our smallest cathedrals, whilst the Pantheon, St. Eustache, St. Sulpice, and others are on a very much larger scale. Most of our city churches, whether in London or elsewhere, are quite toys when compared with those across the water, and our modern efforts at church building are, in comparison, equally small. We keep to the old traditions in this. We think St. Alban's, Holborn, or St. Augustine's, Kilburn, large modern churches. They are, literally, not half the size of an average modern French church. Under these circumstances, we must be careful in our judgment, and compare like with like, not assuming that what is acoustically successful in one place will equally succeed in another.

It is, too, the exception to find a foreign church which is not stone vaulted. Stone vaulting is not, and never was, common in our land.

Some of our noblest churches of the first magnitude are only vaulted in part; it is rare indeed to find a vaulted parish church. A stone-vaulted roof has a wonderful effect on organ tone, adding that mystery and resonance without which the true grandeur and magnificence of the instrument is half lost. We can note this for ourselves by observing the quality of sound in a vaulted church like St. Peter's, Vauxhall, which is but a small building, with the quality of tone in an ordinary open-roofed church of about the same dimensions.

Mr. Audsley, in his interesting paper, gave us a glowing description of a wondrous cathedral which must have a choir bigger than that at York; and which was exactly what a mediæval architect, had he had our conditions of a small capitular body and large congregation, would never have built.

My purpose is to leave the realms of fancy and come to those of fact.

The first question we come upon is that of the position of the organ in the church. There is a good deal of debate about this. Sir F. A. G. Ouseley says truly that there are many interests to consult. He enumerates those of the clergy, the singers, the organist, the architect, and, lastly, the organ builder; but he leaves out the people—why should they be forgotten? and it strikes me—but I may be wrong in this—he leaves out what I must call the ritual point of view; and, when he speaks of the organ's position in parish churches, he is constantly running for his comparisons to cathedrals. I find, too, that in the discussion which followed the reading of Sir F. A. G. Ouseley's very interesting paper, St. Paul's, St. Peter's at Rome, and such trifles are more freely mentioned than modest parish churches such as we grow in this little island. I find, too, that after Mr. Audsley's paper was read, our ideas were large—we talked about cathedrals and such big things more than about those buildings with which we have every day to deal.

Let me invite you to "climb down" and consider ordinary parish churches, living no doubt in hope that folk will agree as time goes on to build them larger, which they are even yet beginning to do.

What is the church built for? This I will try to answer, hoping that others may agree with me.

It is built as a place in which divine worship is to be celebrated, and worship it must be remembered is not the same as prayer. A magnificent musical service, in a magnificent place, is the highest exemplification we can give of divine worship, and not only the clergy, but the people are interested in it, and assist in some way or other.

Who settles what this worship is to be? There have certainly been disputes of late on the interpretation that may be given to the rubrics, but the basis common to all parties in the church is the Prayer Book.

It must, of course, be understood that I do not for one moment wish to enter upon the ground of religious controversy, High Church, Low Church, &c. This is neither the time nor the place; but I imagine that any musician would consider that within the four corners of the Prayer Book (and that is the book of directions with which we have to deal in our churches), a musical high celebration gives the largest field for rendering magnificent worship.

In arranging a church the ability to render magnificent worship should not therefore be impeded.

There was a time when organs and singers had migrated to the west end. When the body and often the galleries of the church were full of square pews, it really did not matter

where the singers were situated, they were sure to have some one looking at them in their pride of place, as people faced all ways. We can recall the gallery, with its brown front made as it seemed of gingerbread, and covered with shiny treacle, a pallid clock-face in the middle, and over it a nice cosy red curtain to hide the organist, being a modest man. The select company of singers, not equally modest, did not require red curtains. The organ rose behind, flanked by tiers of charity children. Magnificent worship was not got in this way.

We seem to have agreed, notwithstanding many divisions of opinion on religious matters, that this was not nice; and on looking back it was found that it states in the prayer book: "And the chancels shall remain as they have done in times past." I cannot go into the whole question now, it is one of history; but I think you will find that in the "times past" the chancel was the place where the music was rendered, and if not intended for the purposes for which we once more use it it is difficult to understand why this part of the church was planned as it was.

The more the subject is considered the more clear does it seem to me that historical continuity fixes us to the chancel.

But let us now conceive ourselves to be members of the congregation. If we are to admit the propriety of ornate worship, why is not the eye as well as the ear to be studied? The very fact that we now aim—as did our forefathers—at building a dignified type of church, and also at decorating it very considerably, shows that the old prejudices are dying out, and that people do not now think well to have splendid drawing-rooms but bare churches. And, happily, ornament in a church is no longer considered a party badge.

I contend that—at least to me as a member of the congregation with, as I hope, artistic instincts—a fairly large chancel, the choristers in it, and the music they perform therein, are all more dignified and impressive because the whole scene is before me, and there is complete unity in it. Break this up and you lose a great deal.

I must not dwell longer on this side of the question, time will not permit; but I have said enough to show why, as I contend, the chancel is the right place for the choristers, and will, in ninety-nine cases out of a hundred, continue to be used as such.

If the choristers are in the chancel the organ must be near them. Sir F. A. G. Ouseley says, speaking of organs in the west gallery (p. 83): "and indeed it *must* be there if the singers sit in the west gallery." He evidently thought that the two must be together, and his statement applies as well to the chancel as it does to the west gallery.

We all know that the organ must have plenty of space

about it, height above it, and must not in itself be crowded; but there are other points on which the opinion of experts would be of great value.

One of these is the position of the keyboard with regard to the organ and the choir. Custom, ruled to a great extent by expense, makes it usual to place the organ on one side of the chancel and the organist close to the organ. The organist cannot hear his choir very clearly. The half of the choir nearest to him sings away from him, the other half that sings towards him has the first-mentioned half intervening. He is generally so near the organ that he cannot clearly hear how much or little noise he is making (and my experience is that to be on the safe side be generally makes too much); and lastly, having the organ and voices so close at hand, he knows but little what the congregation is about.

As far as the choir is concerned the rules of ample space, height, and width are as essential for the welfare of voices as of the organ.

What then would be the conditions of an ideal position for the organist?

1. That he should hear his choir well.
2. That he should hear the organ well.
3. That he should be able to see the choir well and also see the clergy who may be serving at the altar.
4. That he may hear the congregation at least fairly well.
5. That he shall have a tolerable sight of the nave of the church and thus be able to keep his eye on processions or other functions taking place therein.
6. We might add, that he should be able to use the organ in connection with a side chapel.

Where all these combinations are to be found I do not know. In a parish church of good size they would be difficult of accomplishment. They are not often approached in a church of the first magnitude.

I will now name certain churches where various positions of the organ, the organist, and the choir lead in a direction away from what I may call the old stock pattern of the organ—in a hole on one side of the chancel, and the organist in more or less of a hole in the organ.

I shall, in these instances, go outside the limit of parish churches, because, if the latter be sufficiently large, the big churches may teach us something.

The opinion of organists upon the relative merits of the instances I am about to mention will be of the greatest value, and particularly will they be instructive to architects, for they have to do their best in giving accommodation to the interested parties, not only without sacrificing the effect of

the building as a church, but being, as a rule, hampered with want of funds.

St. Paul's Cathedral. This church has acoustic qualities which make it quite different from any other building in this country, but the position of the organ, hanging in halves above the choir stalls, is such as would not be out of place in lofty churches of less magnitude than the Cathedral. Indeed, were there shallow recesses in which parts of the organ could be placed, the scheme would be quite practicable.

In St. Paul's the alteration and re-arrangement of the choir is, from the most comprehensive point of view, a failure, because the result has been to turn the building, never intended to be so used, into a monstrous and overgrown parish church with nave and chancel.

The organist sits on the north side, in the north half of the organ, and about eighteen or twenty feet above the choir. I say, advisedly, *in* the organ, for he is boxed in to an extraordinary degree, and, I think, a plumb-line dropped from the great diapasons overhead would almost fall behind him.

From his place he hears the voices most perfectly. I should suppose that nothing could be better in this respect. He can hear the swell and choir organs which are on the south side of the church very well, but the great organ is most imperfectly heard. The diapasons, very much overwinded, as I venture to think, puff and whistle to the exclusion of all other sounds. The result is that, unwittingly, the voices are often completely drowned when the great organ is used, partly from the reason above given, but in part because there are not enough stops of a moderate power on the great manual, which is forced up to fill the whole Cathedral, and has not wherewith to support the voices in *forte* passages.

Supposing a similar arrangement of divided and suspended organs were placed in a lofty church, some fifty or sixty feet high, the organ being fifteen or eighteen feet from the ground; would it be best to put the organist in the gallery with the organ, or to place the console somewhere below? Organs so placed would, in an ordinary church, serve the nave as well as they would the choir.

I ought, perhaps, to remind my hearers that, in the sort of waltz which the choir fittings have taken round the eastern limb of the Cathedral during the last twenty-five or thirty years, there was once a time when the organ was in the middle arch on the north side of the choir, and the organist was placed below. This arrangement of the keyboard was found to be unsatisfactory. The keyboard was put up in the gallery with the organ. The instrument, smaller than at present, was all on the north side, and was probably better heard by the player than it now is.

We will now take flight to Westminster Abbey, where the acoustic difficulties of the building are not great, and where the organ stands well in the middle of its work. The organ has the same number of stops as at St. Paul's. The building contains less than half the cubic capacity. From this we may readily understand what a tax is laid on the Cathedral organ, and why it is likely to fail in some respects.

The Abbey organ is divided, part on the north, part on the south, whilst the choir organ and keyboard are on the screen in the middle and at the west-end of the choir. The pedal organ is more incorporated with the organ thus divided than at St. Paul's, where it is all on one side, an arrangement which would, I believe, be very unsatisfactory were it not for the peculiar acoustic qualities of that building. The organist can hear his organ admirably. He can see both up and down the church most perfectly, but the choir is not so pleasantly audible to him as at St. Paul's, nor is the choir organ so immediately near the voices. I fancy, however, that in no building will the keyboard be found better placed, taking all things together, than at Westminster Abbey.

The question immediately arises, what profit can be gained from considering Dr. Bridge's advantages, and how can they be applied in ordinary cases?

We will now take the tram and visit St. Agnes', Kennington. I think that in that church we may get nearest, on a moderate scale, to the Westminster Abbey scheme; not that it has yet been done.

We find ourselves in a good-sized parish church, some forty-five feet high, high arsles, no chancel arch or break in the levels between east and west.

A shallow transept of the full height of the church projects north and south immediately at the entrance to the chancel. At this point the church is crossed by a high screen, with a loft on it. A small organ stands just in the north transept on the loft, and having plenty of space about it, tells with good effect. It is, indeed, far more effective than most organs three times its size put into the regulation rat hole. I have not been into the church for a few years, and some of the objections I am about to raise may have been met, but I do not see how it can have been done.

The greatest objection I observed was that the organist could not see the choir, although it was easy to get a fair view over the church. Although, perhaps, no higher up than the organist at Westminster Abbey, the shortness of the parish church chancel as against the Abbey choir placed the singers almost under the keyboard at St. Agnes'. The choir could neither be well seen nor heard. The limits of size of a parish church must always present this difficulty, and the conclusion seems forced upon one that although we may,

with excellent effect, get the organ divided and overhead, an arrangement much facilitated by a screen and loft, we cannot put the keyboard there.

If the choir be enforced by a band, the loft may suggest itself as a good place; but the objection again presents itself that it is difficult for a conductor below to be seen by the band above, unless he stands so far east as not to be well placed with regard to his choir.

Supposing, therefore, that the organ be above and the player below, would it be considered best to place him just behind one or other row of stalls, or somewhere east of the stalls with a long action? In that case he would have the voices and organ between himself and the congregation, but he could accompany the service at the altar well, and could use the organ for the side chapel.

We have in London another instance, besides those at St. Paul's and Westminster Abbey, of a divided organ—viz., All Saints', Margaret Street. The sub divisions are in this case placed in the aisles of a short chancel. The openings and surrounding spaces are not large. The organist sits in the north, facing south, and can see his choir and get a fair view of the church in all directions.

Could the position of the keyboard be improved upon?

It is an accident that in this case the church is small.

In another London church, St. Matthew's, Great Peter Street, Westminster, rather lofty and spacious for an average London church, the chancel has an aisle on the north side only. In this the organ stands. The keyboard is placed against the south wall of the chancel, just east of the stalls, the action under the floor. The chancel not having been originally planned for this arrangement, the organ console forms an ugly packing-case construction; but this could be avoided were such a position for the keyboard provided for in the original designing of the chancel. The organist is east of his choir and of the organ, but has none of the choir between him and the organ.

I do not think that, as yet, an organ has been placed in any of our modern churches behind the reredos and altar. In the old preaching-house church of fifty years or more ago the organ occasionally climbed into a gallery in some such position. I think it was to be found there in Marylebone Church. It was, in fact, the old west gallery arrangement.

There is no architectural or ritual reason why the organ should not be placed at the east end of the church, standing on the floor, and screened off by the reredos, and in part incorporated with it. So long as the organ was not the principal object its position would be right enough. But where should the keyboard be?

There is one great objection to the organist sitting in the back row of the choir stalls.

In the first place, the space he must occupy makes an ugly and unsymmetrical gap in the row of choirmen, and prevents the numbers being balanced or equal on each side of the chancel.

If his seat be kept back, the organ being in the aisle so that the choirmen can pass along between his seat and the book boards, the gap is still there occupied by one man sitting and facing one way whilst the others are standing and facing the other.

If the keyboard is incorporated with the book-board and he faces into the chancel he still makes a gap, and the pedals, &c., form a thorough block in the passage. In fact, this arrangement is simply abominable. In either case the organist must surely be too near the choirmen.

It is not satisfactory, as a rule, to place the organist under any part of the organ. When this is done, he is not only under, but often more or less in it.

How far the objection may hold good in such an instance as the following I cannot say.

There is a church of very considerable size—one of the largest English parish churches. The roof, continuous all through, is fifty feet and more from the floor. The whole building is seventy feet wide internally, the aisles being each of them eighteen feet wide and thirty feet high. It is proposed to divide the organ, putting part on an open screen behind the stalls on either side, and the choir organ on the chancel screen. It is proposed to place the keyboard on the floor behind one or other row of stalls, and consequently under one division of the organ. Considering the openness of the position I doubt whether the position will be disadvantageous, more particularly as it is proposed that the choir organ shall be that which its name implies it should be—an organ capable of accompanying the full choir and not a mere half dozen pretty stops useless in *forte* passages.

As I am not pretending to instruct, but rather to seek information for the benefit of myself and others, I shall now venture to take a little journey inside the organ, and I do this especially with regard to the remark that has just been made as to the inadequacy, as it seems to me, of choir organs. The organ of St. Paul's Cathedral, as I have before hinted, seems a conspicuous example of this fault. The choir organ is by no means sufficient to support the full choir.

But at St. Paul's, and in many other cases, the stops on the great manual are voiced with regard to the whole church. As an accompaniment they drown everything; the swell does not in any way make up for this. To those close to the organ the swell may make a very tolerable accompaniment,

as it can be heard even when tight closed; but go half-way down an ordinary church, when the congregation is singing, and the closed swell is hardly audible, nothing but a muddled buzzing is heard, whilst the tranquil clear sounds of the choir organ would be sufficiently audible and yet not loud.

When the swell with reeds is closed — and for some mysterious reason the swell seems always in use—the flattened buzzing is most disagreeable.

The larger the church the less disagreeable is the effect. In the largest buildings it is not in the least disagreeable. Unfortunately, we have one large church to a hundred or two of ordinary size.

The laying out of the interior of the organ with respect to the position assigned to the various sub divisions, and the effect the sound of these sub-divisions will have on the auditor seems much neglected. I frequently observe that in the case of an organ of considerable size, built in one block and placed on one side of the chancel, the pedal department is all in one place, which may be considerably removed from one of the manual departments with which it has to work. One hears all the pedal notes coming distinctly from one place, whilst the tones they are supposed to support come from another. Sitting in the aisle of a church, this breaking up of the sources of sound is often most unpleasant. The organist is, probably, not at all conscious of the state of things. The organ-builder is the man in fault, and he can generally shelter himself behind the statement that the architect has neglected to give him either space or openings sufficient. But, given plenty of space in all directions, I cannot but think that each department of the organ should, as far as possible, have its pedal-stops placed near the manual-stops. At any rate, those of delicate tone should be so placed.

The opinion of those who have gained experience would be of great value in another point I am about to raise:

Is it not important to the organist that the sound-boards should be kept well above his head, or, failing this, that he should be shielded in some way from the direct impact of the sound of the full organ?

In the case of an organ raised in a gallery above the stalls of an ordinary church there is not likely to be height enough in the building to admit of some seven or eight feet of space between the floor of the organ gallery and the sound-boards. In order to get height above the instrument there will be a great temptation to lower the pipe feet, and if the player be up in the gallery his position will be intolerable. I observe that even at Westminster Abbey Dr. Bridge has constructed a primitive sort of screen to shield himself from the *forte* of the swell. At St. Barnabas, Oxford, a low building, with very

depressed aisle roof, the organ has been lifted off the floor to the level of the spring of the nave arches, and a sort of box projecting from the wall of the width of the aisle has been constructed. The organist sits in this den with the organ, which nearly fills it up, and I have heard a rumour that the brains of one man have already given way under the trial. I think it certainly is the most ugly and dreadful place in which I ever saw an organ put, and must simply be torture for the player.

Another point for consideration.

The organ, in these days of mechanical skill, is becoming more and more complete. We shall probably attain to greater development in the imitation of instruments used in the orchestra, whilst the absolute command of an instrument of almost unlimited size is made easier and easier.

Under these circumstances is it not expedient that we should begin to classify the instruments, and frankly accept that there may, or, as I contend, there positively should, be a distinct difference between the effect aimed at in an organ for a church or for a concert-room? At present there seems to be a mere vulgar desire to have the biggest thing possible, and to outdo the next neighbour. King's College Chapel, a building enclosing a very great space, must needs have a bellowing double tuba. One can just tolerate such a thing at York Minster, beside which King's Chapel is but a moderate sized edifice. But close by stands Trinity College Chapel. No sooner has the King's organ been enlarged than Trinity must follow suit, and the organ, already much too big, throws out a hideous crop of thirty-two foot pipes, for which there is no room, and they deface and encumber a building which does not contain, I suppose, half the cubic contents of King's. So we go on, if only people are silly enough to find the money.

Would it not be better to admit that a great number of very pretty and of imitative stops, thoroughly suited as they are to an orchestral organ, are not needed where the music is of a grave and dignified character; and that mere noise is not music at all? In the building of churches the architect is expected, and very rightly, to leave out light adornments. A certain gravity, simplicity, and as much of grandeur as he can command are looked for. Why in the scheming of organs should not the same feeling be studied? The most noble diapasons and everything else of the best, but nothing that can be tortured by unskilled hands into vulgar display.

I believe that there are few of us who would not be offended by a highly dramatic reading of the lessons, with gesticulations, changes of voice, &c. Indeed, such a rendering would not be a reading but a dramatic recitation.

To me the attempt at a dramatic accompaniment to the

Psalms, which we so often hear, is equally offensive. There are, of course, skilled hands that can do these things; but how many more over large organs have we than men who can use them well?

I venture to believe that it would be better for the organ in an average church to have in it but little more than those stops which are really necessary to give a good and sufficient accompaniment. I also believe that all the noblest organ music could be properly rendered on such instruments, and if the hurdy-gurdy modern French pieces could not be played thereon, should we lose anything? To pander to the love for the "pretty" the swell is often made large at the expense of the pedal.

I feel that although I may have exhausted a patient audience, I have by no means exhausted the subject.

The questions I have tried to raise will, if answered, be of use to architects, and just at this time it will be helpful that these and many other kindred matters should be fully considered as being on the lines laid down for the deliberations of a committee of members selected by the College of Organists and the Institute of Architects.

I ought, perhaps, to state that this paper was nearly completed before this committee was formed, and going in part over the same ground was, in the nature of things, unavoidable.

DISCUSSION.

The Chairman.—Ladies and gentlemen, we have had a thoroughly practical paper, which has thrown out a great number of suggestions. There is one gentleman present who, I believe, has furnished to some extent the theme of that paper, and I will call on him to commence the discussion.

Mr. Audsley.—You pay me a very great compliment, Mr. Chairman, but my remarks will be very brief. I must in the first place bear testimony to the ability and knowledge displayed in my friend Mr. Somers Clarke's paper, and I cannot help regretting that it is so short. He has touched on matters in such a skilful way that I cannot help wishing he had developed his paper more in detail. From what he has said it is evident he could have supplied from his own personal knowledge a paper of a much longer character. I agree most thoroughly with Mr. Somers Clarke on one subject, and that is the usual overblowing of organ pipes. His remarks specially alluded to the diapasons of St. Paul's organ, and if they had reference to them only, one would not feel so much regret, but they apply equally to a very large

number of important organs constructed under the present system of organ building. The blowing of organs with higher and higher pressures of wind, whereby they are rapidly approaching the tones of steam whistles, is very much to be condemned. It is impossible to have a church organ with that dignified, grand, and rolling tone, which is such a fine accompaniment to the human voice, if one overblows the pipes; one will produce a false character of tone, which is extremely offensive, and which will not blend with the human voice. With regard to placing the claviers in the choir stalls, I do not quite see the impossibility of managing the arrangement desired in a more simple manner than has hitherto been done; but that involves architectural questions, which would be quite undesirable to bring forward now. I think we must look in the future to have the position of the claviers somewhere on the ground floor, as near as possible to the choir stalls. The exact position of course will be dictated by special circumstances, but I think myself, from long observation, that it is decidedly beneficial for the organist to have a very clear idea of the effect he is producing to the ears of other people in the building. He is not playing the organ for his own hearing, nor exactly for the hearing of the choir, beyond accompanying and leading it, so his position should be one from where he can form a fair idea of what the congregation are listening to. That is an important consideration with regard to the position of the organist. He plays for the glory of God, and for the benefit of the congregation; and I think the benefit of the congregation is the question we have to consider at the present moment; therefore he ought to be placed in a position where he may be able to form a correct idea whether he is drowning the voices or not, which organists very often do. The treatment of the Swell Organ is a matter which we might profitably discuss at some length, especially the imperfect manner in which Swell Organs are at present constructed—that is to say, with the desire to get the effect of the swell when closed to be so absolutely an annihilation of sound that it is no longer a musical instrument at all. In that condition it is more like the buzzing of a bee in a bottle than the musical tones of an organ. I think if swells were more accurately constructed we should not have that sudden burst one hears when the swell is opened and then closed. The effect should be similar to that of an orchestra when playing *piano* or *pianissimo*—it should be soft, but every quality of the tones should be present If the swell is constructed scientifically so that it shall not absolutely kill the sound when closed, a great evil will be cured which obtains in most modern organs, or, at all events, it will be very materially diminished. To construct swell boxes three inches

thick with two inches of wood, and the other inch stuffed with sawdust or felt, is one of the most absurd modes of proceeding one can imagine. A swell box of an inch and a half thick, properly constructed of solid wood, will give all the *crescendo* required, and will not kill the sound when it is closed. There is no question that the present system of swell-box construction is destructive to the legitimate effect of the Swell Organ. With regard to the stops of the Pedal Organ, there is no question Mr. Somers Clarke is right if we recognise the fact that the Pedal Organ is the legitimate bass for the manuals departments, and not an altogether independent department. The chief office of the pedal stops is to carry down the chief stops of the manuals and to supply the bass thereto. It is desirable, when practicable, that those basses should be as near the corresponding manual stops as possible; but there are great difficulties, of course, in stowing basses of sixteen feet length and of corresponding scale just where they ought to be. The difficulty can only be overcome when there is practically unlimited room, but where you have ample space they should be placed by the side of those stops with which they are most frequently used. It is very desirable that there should be no apparent break when one stop begins and the other ends. With regard to the different kinds of organs, it is remarkable that Mr. Clarke should have made so many remarks in his paper which have been written by myself at some length elsewhere. There are three different kinds of organs which have entirely different starting points and entirely different terminations. The Church Organ, the Concert Organ, and the Chamber Organ should each be planned on special lines as they have distinct and special offices to fulfil. The Church Organ should be built from its own standpoint. It should not be an orchestral organ; it should not be made an organ for display, but should be made an organ to accompany the service in a dignified and refined manner. The departure from this rule has been the destruction of organs innumerable. Fancy stops and ear-ticklers, as I have called them, should not be put into a Church Organ; at all events, until that organ presents to the full the necessary qualities for a Church Organ. But in numerous Church Organs recently built you will find that the diapasons, and all the grand foundation work of the organ, have been seriously reduced to find room for such fancy stops. The Concert Organ must, of course, have all the groundwork of the organ proper, but beyond this there is unlimited scope for developing all the modern appliances; you can place in it all the imitative stops which can be pressed into the service by the ingenuity of organ builders and voicers. Again, in a Chamber Organ you do not want to listen to the grandeur

which belongs to the Church Organ or the vast resources of the Concert Organ. You want to listen to an instrument suitable for the place it occupies and the work it has to do, and which would be out of place elsewhere. In any shape, I hold that the organ is far too noble and far too dignified an instrument to be lowered in any way by the introduction of anything which is, strictly speaking, outside its legitimate aim and end.

Mr. Weschè.—While agreeing in many things with Mr. Clarke, on some points I must join issue with him. In the matter of dramatic accompaniment, for instance, half the effect of the accompaniment is the meaning of it. If you write music to a Psalm or hymn, you endeavour to put as much as you can before your hearers of the meaning of the words. So also in playing an accompaniment. If the player has any power or feeling he will try to bring home to his hearers the power of the hymn or Psalm. As regards the size of organs, you should have an organ as big as possible for the size of the church, and not a bit bigger. The matter of placing the organist is a very important one, as it is essential that he should hear the choir. Everything else should give way to that. The precise position depends on the church, as every church I am acquainted with has different acoustic properties. I think one of the best places I know is St Andrew's, Wells Street, where they have placed the organ up in the gallery about eight feet above the choir stalls. In another church which has rather a narrow chancel the organist is placed in a similar position, but he cannot hear the side of the choir that is under him. So that you cannot make any hard and fast rule. I should think a console somewhere in the middle of the choir, so that he could hear and not be impeded in any way, would be the best position.

Mr. Weaa.—I think the golden rule in placing an organ in a church is to give plenty of room all round it, and then you will not require an instrument half the size. The organist should not mind where he is placed provided he can hear what he is doing, therefore he should be at some distance from his instrument. My own experience is that if you want to hear how the organ sounds the only way is to get someone else to play it to you, and then you can get an idea of the effect you produce. I quite agree with Mr. Audsley that you should give an organist as good an organ as possible, but the size should be regulated by the church. As a general rule, an organ which would cost about £1 per head would generally be sufficient. The most money should be spent on a good bass, building up the organ from the pedals. As regards the many fancy stops we get now, organ recitals are an established

fact, and have also an influence on musical education. Therefore, you want an organ which can produce certain concert effects. If you have a well-trained organist, a man who is a thorough musician, he will not introduce fifes, cymbals, bells, and that kind of thing in the service. Nothing has done more to develop and raise the musicianly capabilities of organists than the instruments which have been placed at their disposal. They have given recitals, and to give recitals you must have an increased knowledge of music. The consequence is a more universal knowledge. It is quite a different thing to give a recital and to accompany a service, and the result of the recital giving is that our organists are no longer kapellmeisters, but many of them are practical musicians, who have produced works of considerable value and importance. I am, therefore, in favour of organs being not too large for the church, but certainly as large, and with as great a diversity of stops, as can be afforded.

Miss Prescott.—I agree with Mr. Clarke in disapproving of these orchestral imitations in the organ, as they are nothing but bad imitations; they never sound like the real thing. I do not think we want them, even in a Concert Organ—one that is to be played with the orchestra—because the real thing is already in the orchestra, and we want in the organ a purely organ-effect, and not imitations of oboes and flutes, and of the human voice singing through its nose. Of course an organ recital is another thing altogether. I have been told of an organ recital in a church in Switzerland where they imitated every instrument in the orchestra. It was a wonderful performance, but the people came away saying it did not sound a bit like an organ. I do not think organists recognise what the organ tone is like, or how little they know about the sound of the organ when they are playing. I have heard a melody played very nicely on the organ, which, in the distance, sounded like consecutive fifths all through, and certainly the organist did not mean that. There is a church in Bristol which I do not think has quite the same arrangement which Mr. Clarke mentioned—I mean St. Mary Redcliffe. The organ is divided on both sides of the choir, and the player has his back to the choir, but he is a little bit above its level, just behind the pulpit, so that he is hidden from the body of the church. At the same time he can see the choir quite easily. It seemed to me a very convenient arrangement.

Mr. Audsley.—Probably some of my remarks may have provoked the observations of Mr. Webb and Miss Prescott. With regard to orchestral stops I may have expressed myself rather badly. As to the Church Organ I quite agree that so soon as you have the organ properly appointed for everything it has to do as a church instrument, there is

no objection to superadding these fancy stops or orchestral stops; but, unfortunately at the present time, my personal observation leads to this conclusion, that these fancy stops are put in at the sacrifice of the legitimate part of the Church Organ. With regard to the recitals and matters of that kind, I should not wish it to be understood that I should ever think of recommending an organ to be put into an important church that would not be capable of lending itself to the full range of music suitable to be played within the walls of a church. On the orchestral aspect of the question I differ very materially from Miss Prescott. I think a Concert Organ may very legitimately have every imitative stop that the ingenuity of the organ builder or voicers can produce. There is the true province for organ recital. When such an organ is played with the orchestra, no organist, if he understands his business, will think of bringing in the imitative stops. The Concert Organ must have the true foundation of the organ, and then have the imitative stops superadded to it, so that of course you have both resources. The true Concert-room Organ is both an accompanimental and a recital organ; and it must be capable of furnishing legitimate aid to the grand orchestra in the most effective manner. May I ask the name of the place in Switzerland which Miss Prescott referred to?

Miss Prescott.—I think it was Fribourg.

Mr. Audsley.—I know Fribourg very well indeed, and I spent two days in the inside of the organ, and did the same at Lucerne along with Herr Haas, the talented organ builder. I know nearly every pipe in the Fribourg and Lucerne instruments, and can assure you they are legitimate organs, although they contain a few imitative stops. Both those organs are of the good old-fashioned German church type, with plenty of diapason character, not quite the English diapason tone; of course they are not imitative organs in any way comparable with that in St. George's Hall, Liverpool, or the Albert Hall, or any of those organs that we consider of the orchestral type.

Mr. Makins.—As a visitor I should like to say a few words upon an organ, with its position and arrangements, which proved most effective. It was a two-manual organ, having eleven stops in the great organ and eight in the swell, with three on the pedals. It was placed on a stage erected on the south side of a chancel, and occupied a shallow site at about twelve feet above the chancel floor. The back of each manual soundboard was not many inches from the wall. The great, swell, and pedal soundboards were all upon the same level, the two former in a line with each other. Looking from the front the great would be seen on the right hand, and the swell on the left, the pedal was in the

front, and its sixteen-foot open stop, of good scale, and in fine spotted metal, formed the centre front of the case; behind this stood a sixteen-foot Posaune and a Bourdon of sixteen-foot tone. The key-board console stood on the chancel floor, just behind the reader's desk; its key, stop, and composition-pedal movements passed up to the soundboards in a casing fixed against the chancel wall. Outside the chancel was an entrance porch to the church, and over this a good-sized chamber approached by a ladder; this chamber contained the bellows and blowing arrangements. The organ was most effective in the church, very agreeable to the player also—who, hearing his instrument perfectly, yet heard the voices equally well.

Mr. Wesché.—The real points raised are, what is the legitimate organ tone and what is the use of reeds? If the organ is used with the orchestra, what is wanted particularly is an instrument with the legitimate organ tone. If a composer writing for the opera wanted to introduce the organ, he would naturally use the diapasons and the mixtures. I believe that organ in Fribourg has any quantity of mixtures.

Mr. Audsley.—All German organs have, but they are very loud and screamy. You can only use them with a full organ. I think this is a very great mistake.

The Chairman.—Although we have had but a small attendance to day, there has been a very interesting and rather considerable discussion, and we have arrived at several conclusions, on which I think we all agree. I am not a practical organist, and, therefore, I wish that either the President or Dr. Bridge had been here to day to take the chair, when no doubt we should have benefited considerably by their practical knowledge. But speaking as an ordinary member of a congregation who takes a considerable interest in church music, I must say that there are several things which have often struck me. One is, that there is too much noise. Another is the unartistic use of the stops. Of course, if we had all first-class, highly educated organists, it would be an entirely different thing; but unfortunately that is not always the case, and we frequently hear a most injudicious use of the stops. In many places I think we have our organs too large for the space. Whether it should be that the space ought to be enlarged for the organ may be another thing, but as it is, the waves of sound have no room to expand and produce the grand, massive effects which one expects from an organ in a church; but you find all the sound coming from some hole where the organ is placed, and the whole effect is spoilt. I would infinitely rather have a smaller instrument than attempt to have one which has no room to show its powers properly. Before anything was said about organ recitals the idea passed through

my mind that a great deal has been done in building organs with a view to organ recitals in these days in churches, but that is a consideration which in a Church Organ for church purposes I cannot think of much importance. I do not see why a Church Organ should be used for anything more than its legitimate purpose, that of accompanying a choir, or performing such music as is necessary for the purposes of the service. I do not see any reason why we should have an organ with fancy stops put into a church merely that it may be used at a recital. The proper place for a recital is, to my mind, a town hall, or some other such place. If you use the organ in church let it be used as far as possible legitimately, but not otherwise. I do not like, as a general rule, organ recitals in churches, and I have heard more music misused at these recitals than I ever heard anywhere else. A friend of mine said to me only the other day—he had just come up from a certain town on the South coast—he was a clergyman, and he added: "I went into such and such a church, and I heard some music being played there that I thought was most improper in a church; they were playing nothing but regular jigs." I quite agreed with him that that is not the sort of music for a Church Organ. My theory is that the proper function of an organ in a church is to support and lend tone colour to the choir, but that beyond that the organist, as a solo instrumentalist, has no business in the church at all. If you want to hear real church music, where do you find it given with greater beauty and grandeur of tone than in the Eastern church, where no organ at all is employed? I certainly understood Miss Prescott to allude to an organ with fancy stops being played along with the orchestra itself, to be used simultaneously, but as far as my experience goes I have generally observed that when an organ is used in such cases those particular stops are silent, and the legitimate organ effect produced.

Miss Prescott.—What I meant was that they are not required in an organ which is used with the orchestra.

The Chairman.—But then you have the recitals to account for, which on a Concert Organ would be legitimate and proper. At the first performance of "Elijah" at Birmingham under Mendelssohn, the organ, as well as I remember, was used. Of course the organ part did not interfere with the scoring for the instruments.

Miss Prescott.—It had the effect of what you call the Church Organ?

The Chairman.—Yes, it was brought in to produce those great massive effects which are peculiar to itself. I think now we have had a very useful discussion and elicited many valuable opinions, and, so far as I can see, the consensus of opinion is very marked, that we want our church services

conducted properly, we want an organist to know his business and to be a trained musician, and we also want each particular class of organ used in its legitimate and proper place.

Mr. J. Peacy Baker.—As regards orchestral stops in a Church Organ, we ought to remember that performances of sacred cantatas and oratorios in church are very common now, and have considerable religious value. It seems a little bit hard on the organist if he is to be debarred from making use of orchestral effects on such occasions, especially if he be acquainted with the full score of the work. Nevertheless, the primary object of the organ is, of course, to accompany public worship, and it must, therefore, in the first place be adapted for that purpose before these orchestral effects can be considered. I think a good many of our organists, especially amateurs, are misled when they go to recitals. They hear these ear-tickling stops, and when the time comes for them to have a new organ, they will insist on choosing stops which produce an overgrown swell and a very small great; instead of directing their attention to securing a good body and an adequate bass for their instrument.

Mr. Somers Clarke.—I shall be very brief in replying, Mr. Chairman. First of all, I must thank Mr. Audsley for what he said, and I am very glad that he has already in print, although not yet published, remarks in the sense of those I have just made. I have been looking forward for a long time to his large book on the organ which is coming out. Dramatic accompaniment and orchestral effects and so on have been spoken of by several speakers. My contention is that the organ cannot yield a true orchestral effect. I go as far as to say that when you attempt to do it it is always more or less a failure, and I very much regret to see that any organist should desire to produce an orchestral effect, because it seems to assist in keeping out the real orchestra from the church; and I can tell you that that has actually happened. Nothing is so beautiful as to hear real stringed instruments, or others. When those are in the church we do not want the organ to be producing imitative orchestral effects, but only the broad, grand tones, which are the legitimate effects the instrument can best produce. When, however, one has to be all over the country, as is my fate very often, I hear a great many performers who are really more of amateurs than educated organists, and these gentlemen will have these pretty stops, and they play most considerable pranks. They are organists in the church, but are hardly professionals, as the greater part of their time is spent in an office, or in some occupation apart from music. The only wonder is that they do as well as they do.

Mr. Wesche.—With regard to dramatic accompaniments,

I did not mean to imitate the orchestra, but to produce certain expressive effects. I understood you to suggest that the correct accompaniment would be passionless playing with the same quantity of tone right throughout.

Mr. Somers Clarke.—No. What I contend is, that music on the organ should be of a suitable character; grave, but with such tone and refinement as you may like to give. That will give a sufficient amount of dramatic illustration to the accompaniment.

Mr. Weschè.—You would play a penitential Psalm slowly and quietly, but if there were any change in the sentiment you would increase the tone.

The Chairman.—I confess I thought you meant a little more than that.

Mr. Weschè.—I do not mean using drums or triangles, or anything like that.

Mr. Somers Clarke.—When the sea roars then the swell bursts out. It reminds me of an organist who was considerably disappointed with an organ. He said: "I am not satisfied with the result; in fact, I cannot 'grin like a dog and run about the city.'" One knows all this style of silly tricks. With regard to organ recitals, I go so far as to affirm that an organ recital is, as a rule, a thing absolutely not worth listening to, because when it occurs the performer seldom plays grand organ music—music absolutely appropriate to the organ, but versions of something else, and you have a little piece from Wagner's "Tannhauser," or what not. I fear, too, that with many players such enormous resources as an orchestral organ gives are almost sure to lead them astray. I can understand when a man is writing for the orchestra he feels very seriously what he has to do, and gets up his facts, thinks them out, and refines and polishes them; but, on the other hand, when he has simply the whole orchestra at his fingers' ends, it is a very great temptation to him, and the result often is that a member of the congregation, with a sensitive ear, is practically wearied out with his performance, and almost wishes there was a grinder. One speaker had remarked "that every organ should be as good as possible"; but the whole question turns upon what that might be taken to mean. There was one more statement I was going to make. I dare say it will not be agreed with; but my contention is, that so thoroughly undesirable is it to try and make one instrument imitate another, that I most distinctly object to hearing an orchestral accompaniment to a mass translated into an organ accompaniment. I am very fond of going to St. Paul's Cathedral, where they take every pains to do things extremely well. There is a certain service of Schubert's which is often performed there. There is a sort of imitation of violins, but it is

not in the least like violins, and it is not like an organ. It is not grand; you feel it is very clever, but that is all you can say. I would sooner hear Merbecke's Te Deum any day with a fine diapason accompaniment, because of its grandeur and simplicity. I can only thank you for your kindness in listening to my paper.

The CHAIRMAN then proposed a vote of thanks to Mr. Somers Clarke, which was carried unanimously.

Major G. A. CRAWFORD

In the Chair.

NOTES ON IRISH MUSIC.

By F. St. John Lacy.

It is the fashion now-a-days amongst the members of that class of society to whom the term of musical amateur belongs to express the greatest admiration for the folk-songs and melodies of the people. Unlike many of their tastes, this is one which, if rightly used, is worthy of great commendation, for nowhere can the characteristics and feelings of a nation be better read and understood than in the songs of their people. It is in their music that their real selves stand revealed, and it is in music that their inmost thoughts and feelings are expressed.

Speech, we are told, somewhat cynically, has been given us for the concealment of thought; but this is not so with music, that admits of no concealment; what the composer feels he must utter, and he cannot utter otherwise than as he feels. It is related of an eminent man that he once said: "Let me make the nation's ballads, and let who will make their laws"—intending thereby to convey that the power and feelings instilled into the people by their songs was greater than that instilled by their laws. In like manner, a musical antiquarian may be imagined to say: "Show me a nation's music and I will tell you the character of its people."

Unfortunately, however, this liking for national music is almost entirely restricted to that of foreign nations, whilst carefully ignoring the musical treasures of our own land. Passing over the music of Great Britain as foreign to the subject-matter of this paper, and confining ourselves to the consideration of that of Ireland, one is indeed at a loss to account for the neglect it has received, a music which, for depth of passion and richness of feeling, I do not think I am wrong in saying to be unequalled. In support of this statement I will here quote from a paper recently read by Professor Villiers Stanford before the London School Board, in which, speaking of the folk-music of the British Isles,

he is reported to have said: "There were two distinct schools, the Saxon and the Celtic; and four distinct styles—English, Welsh, Scotch, and Irish. The English was strong, solid, and straightforward; the Welsh full of dash and go; the Scotch, a mixture of humorous and poetic, full of strongly marked rhythms, dry and caustic at times, full of the quality which might be termed 'lilt'; the Irish was the most remarkable literature of folk-music in the world—there was no emotion with which it did not deal successfully, and none had more power of pathos and fire."

Thanks to the enthusiasm of zealous antiquarians, and the various discoveries—consisting of artistically illuminated MSS. and specimens of ornamental art work with which their researches have been from time to time rewarded—coupled with the statements of contemporaneous historians, there is no longer any doubt but that long prior to the period of the English invasion, Ireland was remarkable as the seat of highly developed artistic culture. Unfortunately they appear to have had no method of tablature or means of recording their music in writing—at all events, none such has been discovered—depending simply on their tunes being handed down by ear from harper to harper. No specimens having come down to us which we can definitely assign to that early period, and from which we could tell what it was like, we have to depend altogether on the statements of those early writers in whose works we find any mention of the subject. That their skill was great, the oft-quoted opinion of John of Salisbury goes to prove. Writing during the twelfth century, he says: "The attention of this people to musical instruments I find worthy of commendation, in which their skill is beyond comparison superior to that of any nation I have seen." Also Giraldus Cambrensis (Gerald Barry), whilst taking care to let us know that there was scarce anything else to commend among them, declares that, "The Irish, above any other nation, is incomparably skilled in symphonal music." These are not isolated opinions, for we find them supported by various writers of the twelfth, thirteenth, fourteenth, fifteenth, and sixteenth centuries, such as Caradoc of Lhancarvan, Fordun, Bacon, Spenser, Camden, and many others.

The first-named, Caradoc of Lhancarvan, the Welsh historian, asserts that the Irish devised the instruments, tunes, and measures in use among the Welsh. This statement deserves some notice. In the time of Gruffydh ap Conan, Prince of North Wales, and by his command, there was holden a congress of Welsh and Irish bards, the latter brought over to Wales by the prince himself, in order to revise the laws of the minstrels of North Wales. As a result of this meeting, there were elaborated twenty-four measures of music and five principal keys. The preamble

to the statute embodying this result says: "These are the twenty-four measures of instrumental music, all according to the rule of metre, as they were composed in a congress before many doctors of the art, of Welshmen and Irishmen, skilled in the art in the time of Gruffyd ap Cynan, and there were entered in books, by command, at the same time."

This preamble, written in the Welsh language, has been easily translated by Welsh historians; but the names of the different measures forming part of the same document had presented a great deal of difficulty, Mr. Jones, in his "Relics of the Welsh Bards," confessing his inability to translate them. Subsequently the names of these measures, forming an integral part of the statute, were discovered to be written in the Irish language and were then easily understood. This is, I think, good evidence that if the Irish did not create the Welsh music, at least their celebrity at that period—twelfth century—was such that they were called in to adjudicate and settle what the measures and scales of music in use in Wales should be.

In the old tales and poems we find music referred to as being held in the greatest esteem and accredited with wonderful powers. The following extract from "The Story of Froech," the MS. of which is preserved in Trinity College, Dublin, will show this. "His people were all cooking the wild animals. 'Let the harpers play for us,' says Ailill to Froech. 'Let them indeed play,' says Froech. . . . They play for them, so (exquisitely) that twelve men of their family die with weeping and sadness. Gentle and melodious were this triad; and they were the chants of Uaithne. The illustrious triad are three brothers, namely *Gol-traiges* (grief music), *Gen-traiges* (cheering music), and *Suan-traiges* (sleep music). *Boand* from Fairyland is the mother of the triad." We also read of the "string of knowledge" mentioned as belonging to the harp of *Catrbre*, which whenever he struck "there was not from the rising of the sun to its going down any secret of which he was ignorant."

The musical instruments in use of which we have note were the *Stuic*, a small curved metal trumpet; the *Buinne*, a larger kind of the same species; the *Corn*, a large metal tube, curved in shape like an animal's horn, but with the mouth-piece at the side; the *Adharcaidh Chuil*, a musical horn possessing three or four ventage holes, and which was either an animal's horn or made of metal; the *Dudog*, a curved wooden pipe, and the Pipes, of which more anon. This completes the list of wind instruments of which we have any mention. It will be noticed that all were curved in form, no straight trumpet or horn having been discovered. Curiously enough, no allusion to a drum has been found in any of the writings from which we have got what

knowledge of the subject exists, that elementary musical instrument appearing to have been, if not unknown, at least unused. At one time it was supposed that the *Tiompan*, which we find often mentioned in the old writings, was a drum; but the following extract from the "Lays of Cailte, son of Ronan," which gives a description of the instrument, proves otherwise:

> "Its rim was made of white silver;
> The pins of yellow gold
> And the strings of bright brass"

This shows it to have been a stringed instrument, and O'Curry thinks it was played with a bow. The only instruments of percussion appear to have been bells of various sizes, and the *Crotaltn* or Musical Branch. This latter was not, however, in use for musical purposes, but as a symbol of authority, for we read that during a contention for precedence between the chiefs *Finn* and *Gaul*, the bards, wishing to cause hostilities to cease, "shook the chain of silence, and flung themselves among the ranks." Various other references could be given, if necessary, to prove that it was used in public and private assemblies as a means of obtaining silence by some one in authority.

But the instrument most in use, and the one especially identified with Irish music, was the harp. It was also the instrument to the performer on which most dignity attached, for the players held social rank according to the instruments on which they performed, the harper being at the top and the piper at the bottom of the social musical scale; the harper, so to speak, being the melody, the piper the bass of the social cantata. Thus we find, in the "Brehon Laws": "This is the only species of music, that is, it is the only profession which is entitled to be ennobled . . . even though it does not attend on the illustrious . . . but it being noble in its own right." The ability to play the harp was considered a necessary part of a gentleman's education, the instrument being handed round at feasts from one to another of the guests.

The period at which the harp became known in Ireland can be but a matter of conjecture, but it was probably introduced therein during the fifth century, when the Scots—by which name the inhabitants of Ireland were then known, Ireland itself being called Scotia—Picts, and Saxons were leagued together to harass the shores of Britain. Though it may have been known long prior to that date for the matter is one of great uncertainty.

The most ancient name for the harp was *cruit*, and the form and number of strings has varied from time to time. In an ancient Irish manuscript dealing with the adventures of

Find MacCumhaill which is preserved in the library of the Royal Irish Academy, and is believed by O'Curry to be "many centuries older" than the twelfth century, we find mention of a harp with three strings. The passage I give in full, affording, as it does, an additional illustration of the three modes of music and the effects attributed to them. (I may here mention that three appears to have been considered a number of great power, as instance of which we have the three tragic poems of Ireland—viz., "The fate of the children of Touran," "The fate of the children of Lir," and "The fate of the children of Usnach.") Here is the passage referred to, as translated by O'Curry —

> "The household harp was one of three strings,
> Methinks it was a pleasant jewel
> A string of iron, a string of noble bronze,
> And a string of entire silver
> The name of the not heavy strings
> Were *Suantorrgles*; *Geantorrgles* the great;
> *Goltarrgles* was the other string,
> Which sends all men to crying
> If the pure *Goltearglès* be played
> For the heavy hosts of the earth,
> The hosts of the world without delay
> Would all be sent to constant crying.
> If the merry *Geantorrglès* be played
> For the hosts of the earth, without heavy execution,
> They would all be laughing from it
> From the hour of the one day to the same of the next,
> If the free *Suantorrgles* were played
> To the hosts of the wide universe,
> The men of the world—great the wonder—
> Would fall into a long sleep"

That the poet here means to describe an actual instrument, and is not speaking figuratively, I have but slight doubt, though the effects attributed to the playing of it may warrant the latter assumption. Later on we find, in the "Yellow Book of Lecan," compiled in the fourteenth century, an eight-stringed harp mentioned, as follows:—"On a certain day . . . there came to him the abbot of a church of the *Ui Cormaic*, and he sat on the couch and he took his little *Ocht-Tedach* (eight-stringed instrument) unto him from his girdle and he played sweet music and sang a poem to it."

In the twelfth century there were two kinds of harps in use. The small harp, called *Keirnine*, which was thirty-two inches in height, and was strung with single chords. At first having eighteen strings, the number was increased to twenty-eight. The larger harp, called *Ceannaire Croith*, had thirty-three strings, was five feet high, and was strung with double chords. These were used for public assemblies and by bards and minstrels, who required attendants to carry their harps from place to place. The smaller ones were played whilst held on the knee, and are so represented on some of the

crosses of the eighth and ninth centuries. They were chiefly used by the ecclesiastics and by ladies. The strings were of brass and were played, the smaller with the finger nails, which were allowed to grow long for the purpose, and the larger with the plectrum. The bass was played with the right hand and the treble with the left, and the arpeggios were always played downward, commencing with the highest note of the chord. With the exception of increasing the number of strings in the smaller to thirty-three, there has been no other change in the construction of the Irish harp.

During the period between the eighth and fourteenth centuries, and perhaps earlier, it was the custom for the Irish harpers to travel through Europe in the exercise of their art, and we have it on the authority of Dante that they introduced the harp into Italy. But the invasion of Ireland marked the beginning of the decline of harp-playing. Harassed as the country was with incessant wars, music was not likely to flourish, particularly as the harpers, who naturally sided with their own countrymen, were put down with an unsparing hand. Under such circumstances, we cannot be surprised that the art of harp-playing should have died out, and that in the present day no players should exist.

Several attempts have been made in modern times to resuscitate the harp, and with this object meetings of harpers have been held from time to time, but they all failed to effect their purpose. There had been the "Contentions of Bards" at Bruree, 1730-1750, at Granard in 1781-1782, and the last, and greatest, held at Belfast on the 11th, 12th, and 13th July, 1792, when, as Bunting says, "all the best harpers of the old school then living were present." They were ten in number. Careful note was taken of their harps, method of tuning, and musical terms, and they were all found to agree in a remarkable manner.

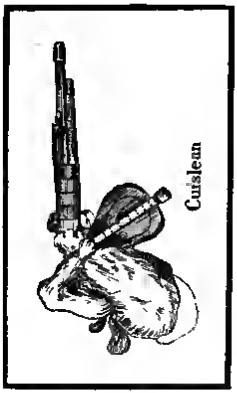
As there are but few specimens of the Irish harp known to be in existence, it may be of interest if I give a list of them.

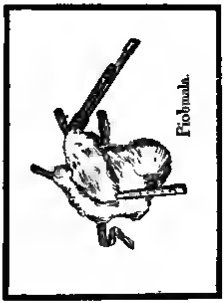
The most ancient is that known as the "Brian Boiromhe's," in Trinity College, Dublin, supposed to have belonged to that monarch, who was killed at the battle of Clontarf in 1014, though recent investigation would seem to show it as belonging to a much later period, about the fourteenth century. It is four feet high, and has thirty strings, one to each note.

Next comes the "Dalway," or "Fitzgerald" harp, nearly twice the size of the former one. It is dated 1621, and is thought to have had fifty-two strings, but from the sounding-board being gone the number is uncertain. Petrie mentions another about the same size as the "Dalway" harp as in the keeping of the Kildare family, and dated 1672.


The "Heber" Harp
5 Ft High, 33 Strings.


"Brian Boru's" Harp.


Cuisleun


Fiolmala.

Harps of the eighteenth century are more numerous: they are—

"Hempson's" harp in the keeping of Sir H. Bruce.

The "Otway" harp, dated 1707, in the possession of Captain Otway.

The "Heller" harp, five feet high, with thirty-three strings, trace lost since 1786. A representation of it is given in Ledwich's "Antiquities."

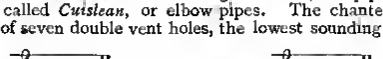
The "Magennis" harp, seen by Petrie in 1832. All trace lost.

The "Robin Adair" harp, preserved in Hollybrook House, co. Wicklow.

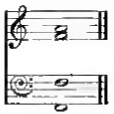
And two harps in the Royal Irish Academy, one of which, known as "Carolan's" harp, O'Curry believes to be a forgery; the other is plain, the only ornamentation being a bird's head in the fore pillar.

In addition to these, and as I have reason to believe hitherto unknown to collectors, is the harp which, through the kindness of my friend and pupil, Mr. R. Shafto Adair, I am enabled to show you this afternoon. Though modern in structure, and probably not older than the beginning of the present century, it cannot fail to be of interest when so few specimens exist. It is three feet in height, and is without ornamental carving of any kind, being made quite plain, the only ornamentation being a tracery of shamrocks in gold on a green ground. From the number of holes and pegs in the sounding-board, and the corresponding number of pins, of which there are two to each string, in the Neck, or "Harmonic curve" as it is called, we see that the number of strings was thirty-three. It was presented to Lady Adair on the occasion of her marriage in 1850 by one of the tenantry on the estate, who stated it to have been in his family for a great number of years.

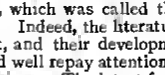
The only other instrument in use among the early Irish was the bagpipe, which, essentially the instrument of the peasantry, can apparently boast of a very respectable antiquity. Originally, like the Scotch pipes, blown by means of a pipe in the mouth of the player, it also resembled them in its tone and use as a means for urging on the combatants in time of war. The chanter had six vent holes, and there were two drones. In this state it was called *Piobmala*. About the sixteenth century, however, its formation underwent a radical change. The mouth pipe was taken away, and in its stead a pair of bellows, strapped to the arm and worked by the pressure of the elbow, supplied the wind-bag with air. With this came a change in name, the pipes now being called *Cuislean*, or elbow pipes. The chanter consisted of seven double vent holes, the lowest sounding D'.—



the seventh above, and there were four drones sounding, according to Beauford, great F, small F, F', and A'—



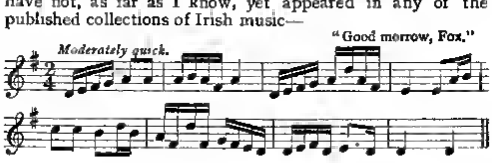
the effect of which, if he be correct in his statement, would be decidedly more peculiar than pleasant. Probably, however, as the pipers could play without the drones, they could also shut off any one of them separately. Some of the instruments had, in addition, a second chanter sounding a fifth below the first, which was called the regulator, but its use we are not told. Indeed, the literature of the Irish pipes is remarkably scant, and their development seems to be a subject which would well repay attention on the part of some of our musical historians. The latest form of the pipes and, I am sorry to have to say, the last, for the instrument is rapidly disappearing in favour of the flute and violin, is that which is known as the *Union* pipes, probably so called from its appearance dating about the time of the union of the Irish and English parliaments. This is also blown by the bellows, and is of a soft and delicate tone. Its compass is from C' to C'''—

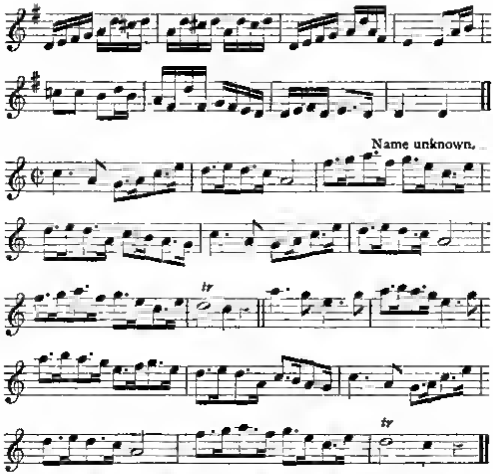


two octaves—with all the semitones, and it is furnished with a rude harmony, consisting of the chords of the dominant and tonic of the key in which the pipes are set. There are three drones, which are generally either tuned in octaves to the key-note or two have the octave and one the fifth. The drones can be silenced at will.

[Illustrations: "Carolan's Draught" (harp tune), "The one and two of pipering" (this tune was considered to be the test of a piper's ability), "Gather up the money" (jig tune).] The following tunes, which I heard in Cork many years ago, and which I afterwards jotted down from memory, have not, as far as I know, yet appeared in any of the published collections of Irish music—

"Good morrow, Fox."



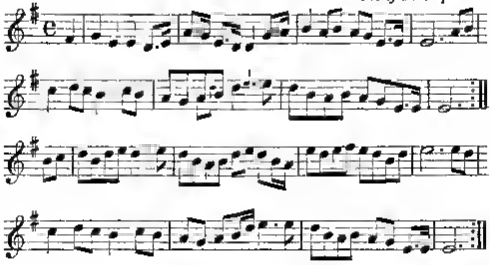


The earliest published collection of Irish tunes known to us is that made by Burke Thumonth, about 1720, but previous to this there may have been isolated specimens inserted in various collections of other music. Thus, for instance, we find three Irish airs in Queen Elizabeth's Virginal Book, "The Ho-hoane," "The Dumpe," and "Callino Casturame." Since Thumonth's there have been several collections all more or less correct, but the ones best known and those on which most reliance can be placed are those of Bunting, of which three series were published, and of Petrie, which stand forth as monuments of painstaking antiquarianism.

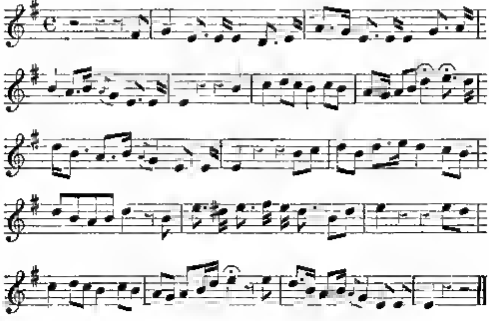
The former collection was the outcome of the last meeting of the Irish harpers at Belfast in 1792, and to complete it he travelled in various parts of Ireland collecting tunes for his work. The first book contains sixty-six airs, the second, seventy-seven, and the third, 150, of which over 120 were printed for the first time. To his collection Moore was indebted for many of the airs which afterwards became so popular in union with his poetry, no less than eleven out of sixteen airs which appeared in the first number of the Irish melodies being taken from Bunting's book. Unfortunately, Moore was not content to leave the airs as he found them,

but must needs alter them to suit his ideas, with the result in many cases of taking all the Irish characteristics out of the airs. On this point I will leave Bunting to speak for himself, which he does as follows, in the preface to the third volume of his collection. "The editor saw with pain, and still deplores the fact, that in these new Irish melodies, the work of the poet was accounted of so paramount an interest that . . . instead of the words being adapted to the tune, the tune was too often adapted to the words." That these strictures were not made without reason, many examples could be adduced to show, did time and space permit; I will, however, content myself with giving the following as a specimen of the alterations made by Moore—

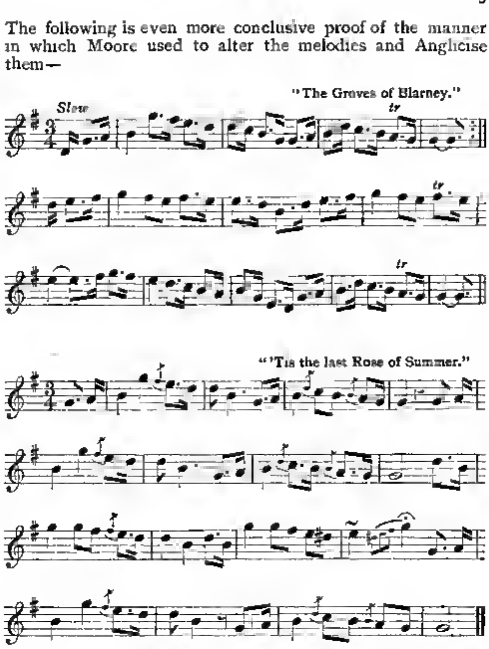
"Molly Macalpin"



"Remember the glories of Brian the Brave."



The following is even more conclusive proof of the manner in which Moore used to alter the melodies and Anglicise them—



I have thought it right to go at some little length into this habit of Moore's of improving the tunes submitted to him, as his collection is the one most generally known, and the one by which Irish music is most judged. It will doubtless surprise some of my hearers to learn, perhaps for the first time, that many of the melodies given by him, as the last example shows, are less Irish than Mooreish.

Petrie's collection, perhaps the most correct and the most carefully undertaken, was made at the request of and for "The Society for the Preservation of Irish Music." One volume, and the first part of a second, is unfortunately all that has been made public. The following, compiled from

various sources, is a list of all the collections of Irish music published.—

1	Burke Thumonth	about 1720.
2.	Neal	1721
3.	Carolan's Son	1747
4.	Bunting (3 Series)	1796—1809—1840
5	Mus. Soc., Dub. (28 New Irish Tunes)	1796
6	Holden	1806.
7.	Moore	1808—1834
8.	Mulholland	1810.
9	National Melodies of England and Ireland	1812.
10.	Thompson	1814.
11.	Fitzimmons and Smith	1816
12.	O Callaghan	1821—1822.
13	Smith	1825.
14.	Horncastle (3 parts)	1844
14A	Spirit of the Nation	1846.
15	Conran	1850.
16	O'Daly	1850.
17	Petrie	1855.
18.	Levey	1858—1878.
19	Hughes	1860.
20.	Joyce	1873—1888.
21.	Molloy	1873.
22.	Mawels	1877
23.	Hoffman	1877.
24.	Greaves	about 1880.
25.	Stanford	1882.
26.	Tours	about 1886.

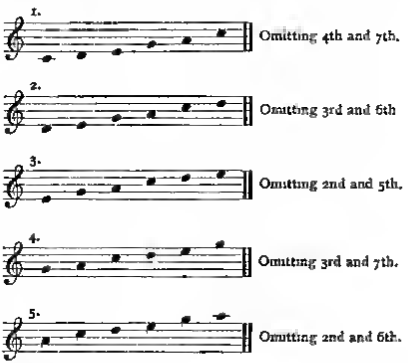
We now come to the consideration of the tunes themselves and the modes or scales in which they were written. Owing to no authoritative description of their methods of music being in existence we have to go to the airs themselves, and deduce from whatever internal evidence we can find therein the modes in ancient use in Ireland.

Many and various have been the suggestions which, from time to time, have been put forward to account for the pervading Irishism of the old tunes. Some have stated the peculiarity to consist in the omission of the *fourth* and *seventh* notes of the scale; others, the emphatic presence of the *submediant*. Well and good. Many airs can be produced in support of both of these assertions, but what of the multitude of those, unmistakably Irish, which *have* the fourth and seventh from the key-note, or which omit the submediant? How are we to explain away the fact of the exceptions to these rules outnumbering the examples that can be adduced in support of them? The fact, which I shall endeavour to prove to you, is that the Irish melodies are not constructed according to one set scale, but according to a series of scales founded on the evolution of one primary scale, and that the pentatonic or five toned scale.

Taking C as our starting point or tonic, we add to it its nearest related harmonic, G the fifth—I dismiss the eighth as practically the same note as the tonic—adding to these two

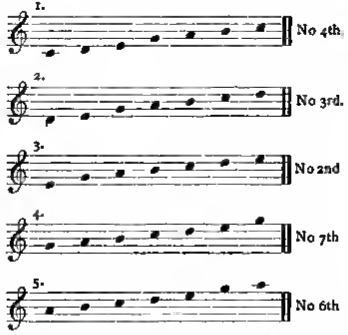
notes similarly the fifth of the last one we get D, and continuing the process we get A from D and E from A. Bringing these notes thus obtained within the compass of the same octave, we have our pentatonic scale thus—

the third and sixth degrees being, of course, slightly sharper than in our tempered scale. Within my own recollection I have heard itinerant fiddlers in Ireland playing these notes slightly sharp, though I much doubt whether now it would be possible to discover a single player making use of the natural scale. This scale was divided into five modes, each step being used as a new tonic, so that there were the following series of modes—



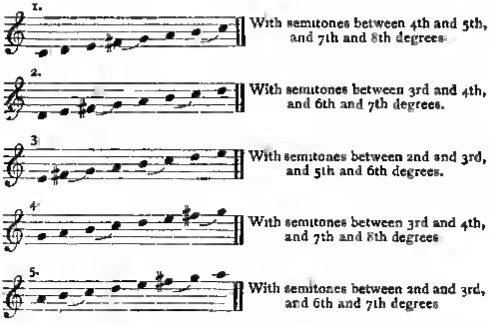
These scales I shall name as those of the "first period." It will be remembered that the note last added, and which completed our five-toned scale was E; still carrying on the process of evolution by the circle of fifths we find B added to our scale, but the number of modes was not increased by the addition of that note as a tonic, nor have they subsequently so increased, the number of modes still remaining five until the system of the scale under treatment gave way before the introduction of the modern tempered scale. We have now

reached what I will call the "second period," where we have got the six-toned scale—

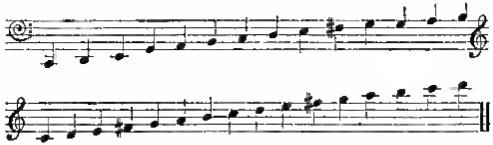


The next step in advance of the previous one was the introduction of the next fifth, that is to say, F♯. These successive additions of semitones to the old whole-toned scale of five notes were no doubt largely due to the influence of the music of the Church.

The addition of this last fifth now completed the octave, and brings us to the "third period," of which the following were the modes—



There was one grand scale in use which went by the name of *Ardfideach*, and this was divided into three parts, called *Basnaeanus* (or bass), *Cionar* (tenor), and *Runchanus* (treble). When the harpers met at Belfast in 1792 this was the scale they used, and which I here reproduce from Bunting, as it gives the compass of their harps—



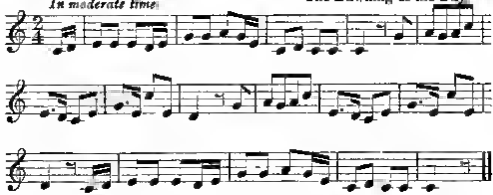
It will be noticed that there was no F♯ in the lowest octave.

From the "Third Period" out the modes borrowed from, and by degrees became merged into, the modern tempered scale, the music written in Ireland now a days differing in no respect as regards its scales and construction from that written in any other European country.

I will now give you examples of tunes in each of the modes during the different periods as far as possible.

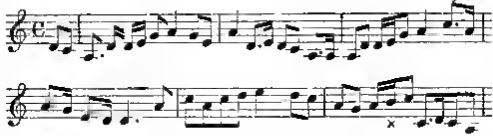
First Period. *First mode*, C to C, with fourth and seventh omitted—

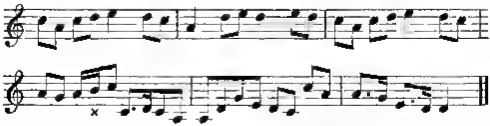
In moderate time. "The Dawning of the Day"



Second mode, D to D, with third and sixth omitted—

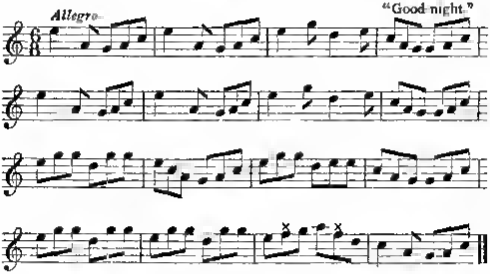
"Lord Mayo"





In the above example, the sixth, it will be observed, occurs once, the phrase in which it is being repeated, but that this is a modern addition will, I think, be apparent from the manner in which that note is avoided in several other places throughout the song. It is obvious where songs, during centuries, have to depend for the accuracy of their reproduction on oral tradition, that additions will inevitably be made, unknowingly and unintentionally, in conformity with the more modern methods of modes in use. This is particularly the case with those of the "First Period," the tendency of which I have spoken causing their peculiarities to be obliterated. For this reason I am unable to give any example of the *Third mode*, E to E, with second and fifth absent.

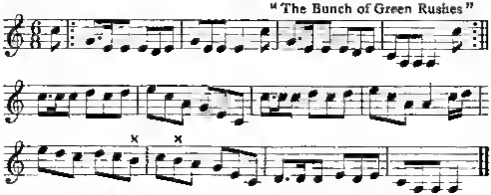
Fourth mode, G to G, without third or seventh—



Here one of the notes, the seventh, is introduced in the penultimate bar. F♮, be it noted, not F♯, as, were it not a modern addition to the tune, the note should be.

Fifth mode, A to A, second and sixth omitted. The following is not quite as satisfactory an example as I would have wished to show, the second occurring twice, but in each instance as a very secondary note. The general characteristics of the air, however, stamp it unmistakably as belonging to this mode—

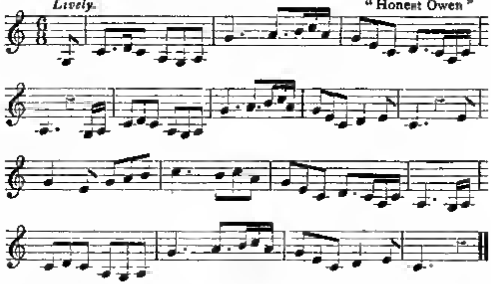
"The Bunch of Green Rushes"



Tunes written in the modes of the Second Period are naturally much more frequently met with, and the difficulty experienced in finding examples of the "First Period" vanished altogether when the Second was approached. Here are examples of this period:—

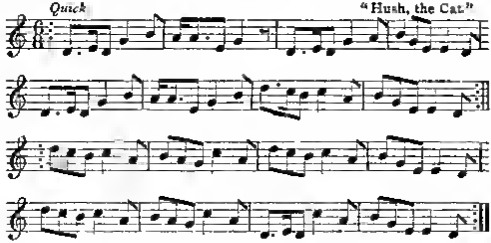
Second period. *First mode*, C to C, no fourth—

Lively. "Honest Owen"



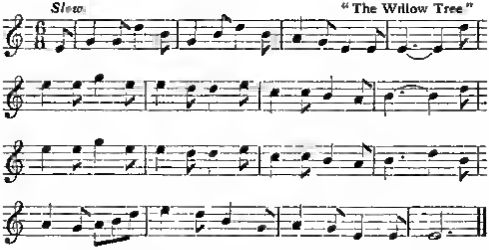
Second mode, D to D, no third—

Quick "Hush, the Cat."



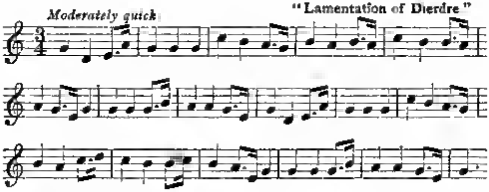
Third mode, E to E, no second—

Slow. "The Willow Tree"



Fourth mode, G to G, no seventh—

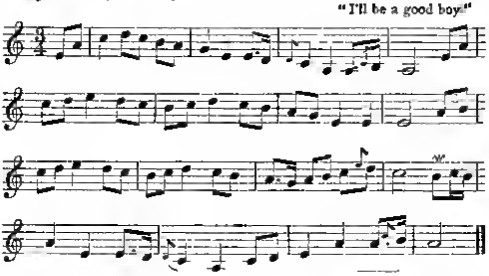
Moderately quick. "Lamentation of Dierdre"



In this mode is also written the well-known tune "The Old Head of Denis," to which Moore has allied his poem "The Meeting of the Waters."

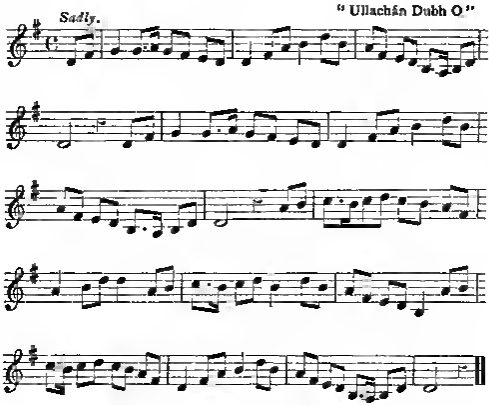
Fifth mode, A to A, no sixth—

"I'll be a good boy."



Entering now upon the "Third Period," I have been unable to find a single example of the use of the *First mode* in its complete form—viz., C to C, with semitones between 4-5 and 7-8. More than that, I am certain that it never could have been so used. Whether when playing in that mode the augmented fourth (F♯) was entirely omitted, or whether, when a fourth was wanted, F♮ was used, I am only able to conjecture. We have it, on the authority of Bunting, that the harpers who played before him used to alter the tuning of their harps when an F♯ was required in the melody by raising the E string in the lowest octave to F♮, and in the upper octaves lowering the F♯ to the same note; but as to when or why they used this F♮ he gives us no information. If they did use this F♮ in this manner, then the *First mode* became identical with the *Fourth mode*, only a fifth lower.

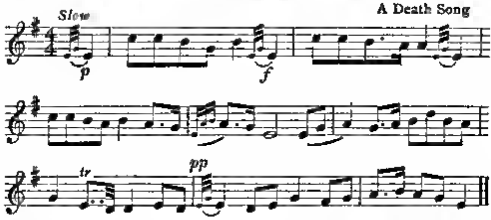
In the *Second mode*, D to D, with semitones between 3-4 and 6-7, we get the well-known tune of "Molly Macalpin," better known, since Moore's time, under the name "Remember the glories of Brian the Brave"; but the following example is, perhaps, less familiar to you—



The *Third mode* appears to have been a popular one, judging from the number of well-known airs found to be written in it. It is similar to our harmonic minor scale, but with a flat seventh, being from E to E, with semitones

between 2-3 and 5-6. The following, which is a death song, gives a good notion of the peculiarities of this scale—

A Death Song

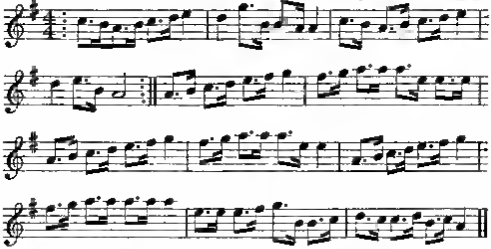


In this mode are the tunes known as "Avenging and bright," and "Brian Boru's March."

The *Fourth mode* is identical with our major scale of G, and so calls for no further comment. "The Coulin" is written in this mode.

The *Fifth mode*, A to A, with semitones between 2-3 and 6-7, has also many well-known airs associated with it. The tune I here give, and which has not up to this appeared in print, I took down from the singing of an Irish girl in Queenstown some years ago. It is called—

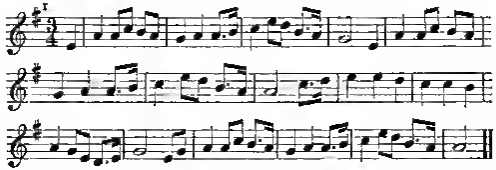
"The Step of the Cippeen"



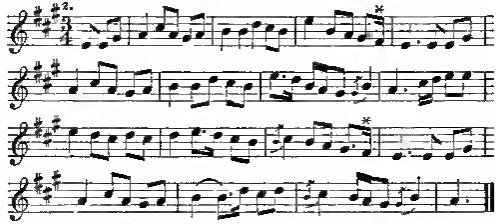
Owing to the construction of these scales it follows that to our modernly trained ears one of the most noticeable points in an Irish air is the absence of the leading note. Once, however, the modern scale came to be in use it was only to be expected that the charm of the new scale should lead to unconscious alterations in the old melodies. Petrie bears witness to this when he says, "I rarely, if ever, obtained two

settings of an unpublished air that were strictly the same, though, in some instances, I have gotten as many as fifty notations of the one melody." That this should be so is not surprising when we remember that the correctness of the rendering depended entirely upon the goodness of the memory of the various singers. Under such conditions alterations were bound to creep in. I will here give you a very good example of this by specimens of the same Irish air as gradually altered.

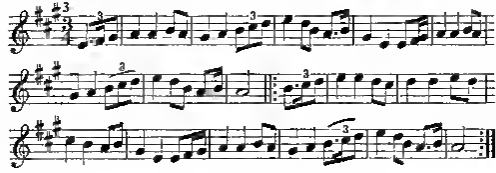
The tune, which is in the mode of A, belongs to the Second Period, as will be seen by the total absence of the sixth—



In the next example we find the sixth introduced as a passing note, and in addition the accents are altered as well as the mode—



Next we find it completely modernised, the sixth being used freely, and to all intents and purposes written in A major—



Each of the avocations of daily life had its own tunes. The mother sings a lullaby as she rocks her darling's cradle, the grandmother croons over her knitting, the ploughboy whistles as he drives his team through the furrows, the lover breathes out his passion in tender sighs, the warrior sings of his battles, and the maiden's voice is heard through the meadow at eve as she sits milking the cows. There is no single occupation or sentiment of life but is represented in the wealth of Irish melody. There is music in the heart of the peasant, and he sings oft despite himself. The heart may be light and so will have its reflection in the song, or it may be heavy, and there is nothing in the world of music hath such pathos as the sadness of a sorrowful Irish song, but heavy or light, there are melodies in the heart at most times, and they are bound to come forth in the lips. The method which the peasantry have of singing these old airs gives an additional peculiarity to them. Their habit of indulging largely in pauses on certain notes of the melody, a free use of the *portamento*, and a way of varying the repetitions of the phrases by the use of graces and ornamentations according to the individual fancy of the singer, renders it difficult to reproduce in musical notation some of the striking characteristics of Irish music as sung by the people.

Dealing with the construction of the tunes, we find the love songs mostly in triple time and divided into two strains, generally of eight bars each. These are again sub-divided into two sections which generally follow one another in this order: first section, second section, oftentimes a repetition of the first either exact or slightly varied, third section, entirely fresh matter in contrast to the two preceding, and almost always in a higher part of the scale, and which leads back to the fourth section, which is a repetition more or less exact, except as to the cadence, which never varies, of the first section. The last example given is constructed on this method, as is also the well-known tune "The Coulin." Another way was to have the third section a repetition of the second, the fourth section being, as usual, a repetition of the first. A good example of this is the tune "My love's an arbutus," wherein the construction is as follows: first strain, second strain, second strain, first strain.

[Illustration, "My love's an arbutus."]

In one or other of these two forms nearly all the ancient melodies will be found to be written, but as they approached nearer to modern times other forms crept into use. A class of tunes, to which Petre has given the name of "Narrative," is much in use with the ballad or street-singers in Munster, to which part of the country they seem to be confined, being but rarely met with in the other counties. They are generally of

a slow and pathetic character, but overladen with runs and graces.

The dances of Ireland are the Planxty, the Reel, and the Jig, of which latter there were several kinds. One of these, called "The Petticotee," was at one time very fashionable, being usually danced after the Minuet. Besides these there were various set dances. Many of these jigs and planxtys were originally written as march tunes, and are often so performed, the slow march being almost unknown. Indeed, most of the marches are in 6-8 or 3-8 time, of which latter "O'Donnel's March" is an example.

DISCUSSION.

Mr. GILBERT WEBB.—I recently heard a lecture delivered by Mr. Evans, of Hereford, on ancient Welsh music, and he very strongly contested the opinion that the early Welsh harpers derived any help from the Irish, more especially in the matter of harps. I cannot give you the authorities now, but he quoted from some old volume in which the Irish harp was spoken of as a recent introduction, and in very disparaging terms. I think the Irish people are greatly to be congratulated on their collections having been made orally, and not from printed matter, as in the case of English ballads. The Scotch are equally fortunate; all the collections of Kinloch and Buchanan were taken down from the lips of the people, while the English collectors of that time went to printed matter in the British Museum and other libraries. The printed "broadsides," as they were called, were the work of second-rate local poets, who, by printing their ballads, could obtain a copyright from Stationers' Hall; but they could not obtain a copyright for original ballads, and therefore they had no call to print these, unless they so altered them that they could claim them as their own. The consequence is that in collections of ballads it always strikes you that the finest belong to Scotland, whereas they are for the most part of English origin, or at least are common property. There are several examples in which Scottish ballads can clearly be traced to the West of England, but which have been altered by Scotch collectors, such were "Lady Mary Anne" and "Johnny Ford."

The Rev. Mr. GALPIN.—I think Mr. Lacy said there was a small harp called the *cruit*.

Mr. LACY.—That was the earliest name of the harp.

The Rev. Mr. GALPIN.—It seems to me that must be identical with the Welsh *crwth*, the five-stringed instrument, somewhat in the form of a lyre; if so, that would

show a close intimacy between the Irish music and Welsh. I would ask Mr. Lacy if he knows whether it was always the custom to string the Irish harp with metal strings?

Mr. Lacy.—Yes, and the small harp was played with the finger nails, not with the tips of the finger, and the large ones with the plectrum.

The Rev. Mr. Galpin.—Then their harps must be totally distinct from the Welsh harp. That was always strung with gut and with triple stringing, as a rule. A harp with metal strings is quite unique.

Mr. Southgate.—I should like to ask Mr. Lacy at what date he speaks respecting the harp when it was strung with metal strings, because we know, as a matter of fact, that metal was not drawn into strings until practically rather late. Before that time I take it they must have used catgut.

Mr. Lacy.—The earliest intimation we have of harps is that they are strung with brass.

Mr. Southgate.—Can you fix the date?

Mr. Lacy.—No, I am unable to fix the date.

Mr. Southgate.—Was there any method of obtaining semitones if required? I refer rather to the later specimen. Some of the Welsh who used the triple harp picked out the semitones.

Mr. Lacy.—I cannot say; but Bunting tells us that in the Harp Congress in 1792 they had a means of obtaining C sharp in addition to the plain diatonic scale. There is no mention of semitones in the scales themselves being obtained at all.

Mr. Southgate.—I take it that some sort of an alteration was made by the fingers simply tightening or shortening the strings, not by a mechanical arrangement.

Mr. Lacy.—Do you mean in the scales I have given you?

Mr. Southgate.—I mean altering the C to make it C sharp. That was not done through a mechanical arrangement.

Mr. Lacy.—On that I have no information.

Mr. Southgate.—Probably it was done by tightening the strings with the fingers. These collections of songs spoken of should be received in all cases with great caution. When melodies are taken down from the lips of persons it is very difficult to say where they are born—whether they belong to that particular district, or have come from other parts. I may refer to the collection of Welsh airs which appeared under the editorship of Brinley Richards, and was issued by Messrs. Boosey. It fell to my lot to examine that volume, and shortly afterwards I met Mr. Richards, and pointed out to him that some of the songs were distinctly not Welsh. He insisted they were, and gave one example that I will mention, and which shows how cautious one ought to be. In that book there is an air termed the "Monks' March," and attached to it is a very pathetic story relating that the

monks of Bangor were driven from their monastery and eventually murdered. During the process of eviction, they sang this doleful thing. Obviously it is comparatively modern music, and certainly it is not Welsh at all. Those who have studied our national music will recognise it is not Welsh, but late English music. I took some trouble to investigate this matter, and I found that this "Monks' March," which it is asserted the monks of Bangor sang when then they went out to be slaughtered, was really sung and played by the troops under General Monk when they went on an expedition to Wales.

Mr. BLAIKLEY.—I should like to ask whether Mr. Lacy knows of any connection between the Welsh pipes and the Highland bagpipes? I do not mean in the mechanical construction, but with regard to the intonation and the scale of the chanter. I think that Mr. Ellis, in his appendix to the table of scales of all instruments, puts forth the idea, whether original or quoted, with regard to the Highland bagpipes that the scale of that has an Eastern origin, and is derived possibly from Arabic or Saracenic sources, and possibly came in with the crusades. It is well known the scale is neither diatonic nor one of those such as Mr. Lacy has given us this evening. I should like to ask, as a matter of interest, whether, as you have referred to the probable co-operation between Irish and Welsh musicians, you can say whether there is anything between the Celtic and Scotch in the same way with respect to the interchange of bagpipe scales?

Mr. LACY.—The only information at all in any way bearing on the question that I know, is that in the old English and Welsh historians they mention that the intonation of the Irish pipes was much superior to that of the Scotch—much brighter.

Mr. BLAIKELY.—What you have given us would show that, but that is according to our standard. Probably the Scotch standard was a totally different one. The Scotch is in use to the present day, and is something quite foreign to our diatonic scale.

Mr. SOUTHGATE.—Are there any ancient bagpipes with the chanters in existence? In that case, of course, the holes would give us the scales in use.

Mr. LACY.—Personally I do not know of any being in existence, only the union pipes, and those are very rare.

Mr. BLAIKLEY.—There is a set now in the Military Exhibition.

The CHAIRMAN.—We have had a very interesting paper, and I will not take up your time by any further remarks on the subject, except just to mention one or two small points. It strikes me that with regard to the traditional preservation of these ancient tunes, they probably were transmitted without very much alteration for a considerable time, because we

know that the bard was usually a hereditary officer in the family of the Celtic chieftains of those times, and you would naturally expect that where an office was continued from father to son the tunes would be preserved with a considerable amount of purity. But afterwards, when they were recited by the peasantry, the variations spoken of would arise. As to comparing the antiquity of Welsh and Irish music, I will not venture on such a thorny question; but there may have been some connection between those countries. Although in some respects of different races, the Welsh and Irish seem to have had some common elements in their origin—viz., an Iberian element, which certainly existed in both Wales and Ireland, the Celtic element being different. The races which are commonly spoken of in a general way as Celtic in Ireland were really considerably mixed, and there was an earlier element non-Celtic in character, and apparently connected with a similar mixed race that existed in the Pyrenees, a race which the Romans for that reason called Celtiberians. As to some of these ancient songs, I should be very much inclined to look for an Eastern origin, because I believe that some of the Irish traditions came in very early times from the Eastern shores of the Mediterranean. We know how traditions travel, and become changed and localised in passing from one country to another. I am certain you may find tunes travelling the same way, and that it would be very difficult to ascertain the home of their birth. With regard to Carolan, who was nearly the last of the Irish bards, it is said that he was considerably influenced by the Italian music of his time, and that some compositions of his are traceable to the works of Corelli, so that, in a historical sense, Carolan does not count for much. What we should like to know would be a great deal more about the early songs of the people. Some of them are certainly curious and interesting. The connection with Scotch music must be taken with a grain of salt. The Celtic inhabitants of Ireland were, of course, largely identical with those of Scotland in race, at any rate, in the Western Highlands, but I do not know whether we have much of genuine old Scottish music in existence. I believe a good deal that is called Scotch music is modern and lowland Scottish, not Celtic at all, but merely manufactured on a particular pattern containing peculiarities of a Scotch character. It would require a long time to discuss at full length the questions which have been raised, and much previous investigation would be necessary; but we have had an interesting and suggestive paper, and anyone who is inclined to go into the matter in the spirit of an antiquary will find in it material which he can work out at home. I will therefore beg to tender the thanks of the meeting to Mr. Lacy for his paper.

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